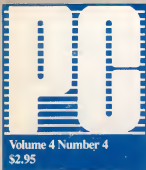


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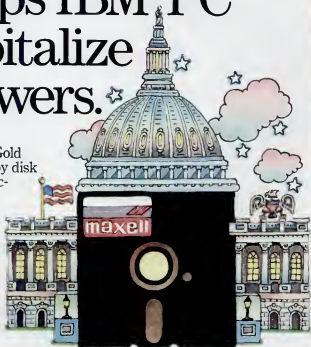


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VOLUME 4 NUMBER 4
FEBRUARY 19, 1985



page 190

COVER STORIES



Adapted for the Screen 116

Glenn A. Hart and Jim Farney/Third-party video boards can improve your screen's resolution and give you more color without annoying flicker.

Video Board Reviews 121

Glenn A. Hart and Jim Farney/This parade of 25 video boards spotlights both winners and also-rans, and you may see just what you're looking for.

Video Wizardry with

PC-EYE 173

Jim Farney/With just one expansion board, PC-EYE Video Capture System turns your PC into a picture machine that allows you to retouch and superimpose video images.

The C-77 Video Mix-up 186

Jim Farney/Rapitech's C-77 Video Mixer merges video images and computer-generated text and graphics on the same screen.

Getting on the Air 190

David Paswell/Produce images for a television broadcast by programming the Motorola MC6845 CRT controller at the heart of the PC's color/graphics card.

APPLICATIONS

The PC Pied Piper of

North Dallas 196

Scott Kariya/A Catholic priest finds that he can communicate with parish kids through his PC.

2010: A PC Odyssey 216

Barbara Krasnoff/Innovative filmmakers Robert Hollander and William Tondreau explain how they use PCs to create special effects—or SFX in film industry lingo—for movies such as the recently released *2010*.

Oxford Goes On-Line 233

Martin Porter/The mammoth *Oxford English Dictionary*, the most complete dictionary of the English language, is scheduled to go on-line by the end of the decade with the PC's help.

FEATURES

PRICE WATERHOUSE REPORT

Accounting for Individual

Tastes 200

G. William Dauphinais and Glen Seller/The *Rags to Riches* program designed for very small businesses fills the gap between spreadsheets and automated accounting systems.

SOFTWARE

Enable Does It Right 209

Diane Burns and S. Venit/The *Enable* integrated package has taken the ideas behind first-generation integrated software products and gone them one better.

SPECIAL FEATURE

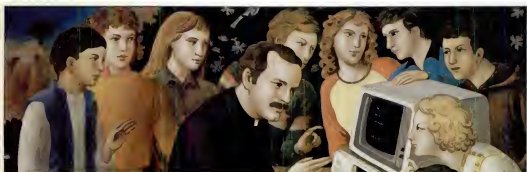
A Microcomputer

Crossword 226

Lindsay Van Gelder/Test your knowledge of microcomputer trivia.



page 216



PRO COLUMNS

DEPARTMENTS

PROGRAMMING
REDirecting Your Files 245

John Dickinson/A way to move your files from one directory to another without using COPY and ERASE.

MEDICINE
PC Clinical Testing 263

Michael Crouch/With *Clinical Research System*, you can systematically analyze statistical information using patient profiles.

FINANCE
Modeling with 1-2-3:
the RAND Command 269

James Boswell/Use the RAND command in 1-2-3 to turn your spreadsheet into a financial model.

LAW
Legal Connections 273

Werner Grunbaum/The ideal law office of the future will probably use local area networks to link together large computers, micros, telephones, and other digital devices. But for now, attorneys generally rely on modems to share information and services.

EDUCATION
Hyped-Up Authoring 277

Gregory Dunn/HyperGraphics has released a capable courseware-authoring system that is useful for creating more than the usual multiple-choice quizzes.

WRITING
Throw Out Your Index
Cards 331

Dara Pearlman/Here's how to turn your editing program into a simple, effective system for filing notes and keeping your research on track.

WHAT'S INSIDE 15

PC NEWS 33

Twelve pages of up-to-the-minute reports, interviews, minireviews, and useful tips, along with entertaining tales, fables, and juicy scoops from the computer community.

FROM THE EDITOR'S SCREEN
Manual Labor? 83

Paul Somerson/Truly well-designed software would make manuals a thing of the past. (For an opposing view, see Guest Editorial.)

GUEST EDITORIAL
Long Live the Almighty Manual 89

Joseph Rigo/Despite such advances as tutorials and help screens, nothing has yet been produced that renders a manual completely useless.

LETTERS TO PC 93

THE NORTON CHRONICLES
Full-Screen Output:
Fast and Compatible 105

Peter Norton/Since DOS lets you down when it comes to writing information on the display screen, you'll want to know about three "screen drivers" that can handle the job.

USER-TO-USER 256

Paul Somerson/PC owners share tips and short programs that may just answer your question about your software or your PC.

PC TUTOR 260

Mark Zachmann/Turn here for answers to readers' technical and nontechnical questions about personal computing.

PC ARCADE
Strategic Moves 241

Phil Wiswell/Test your mettle in a financial race or an international power struggle.


CLUB NEWS 281

Jane Mintzer/Listings of PC user groups.

NEW ON THE MARKET 285

David Obregon/The latest in hardware, software, and accessories for your PC.

PC BLUEBOOK 295

A quick reference guide.

PC:MART 308

PRODUCT INDEX 315

INDEX TO ADVERTISERS 322

BOOK REVIEW
Peering into the PC's Brain:
Assembly Language 327

Dean Hannotte/Two new primers on assembly language programming.

COMING UP
PC Tech Journal 320
PC Magazine 333

Cover Photograph: Dennis Kitchen
Video Art: Gerard Kunkel



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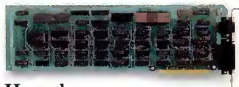
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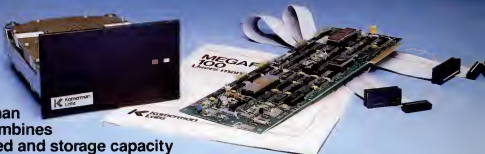
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What's Inside

To create the illustration for this issue's cover, PC's art directors got their mitts on some of the video boards and equipment we reviewed. But will they ever let them go?

It will come as no surprise to those of you in the publishing business that the art and editorial departments here at *PC Magazine* sometimes disagree. In fact, the skirmishes between those who favor the word and those who create the image occasionally blow up into major battles. After all, which is more important to a product review: a paragraph that examines in minute detail all the possible uses of a chip that may someday be invented, or an abstract illustration portraying the artist's conception of PC-DOS?

Harmony

However, this issue's cover illustration was definitely something on which the editorial and art staffs happily agreed. Its unique conception and execution make it especially interesting. (Those of you who only read this column so that you can snicker at our foul-ups and omissions can stop here.)

According to art director Gerard Kunkel, we could have produced the cover art in two ways. "We could have gone to an outside firm and asked it to create the image for us," he explains. "But then we would have lost creative control. Or we could have done it conventionally by faking the appearance of a video image—but that would have been a disservice to our readers."

Instead, design director Peter Blank



and art director Mary Zisk realized that they had, in house, all of the equipment that was necessary to create a high-resolution, reproducible image—the very same collection of video boards we had already assembled for this issue's cover package. With the help of technical coordinator and toy shop factotum Mike O'Cone, the art department put together a super-duper deluxe video system composed of an XT with 512K and a multi-function board, a monochrome display adapter with a parallel port, a Chorus Data Systems PC-EYE board to do the video capture, a Chorus Data Systems Colorverter to fine-tune the video picture and capture color, a Number 9 Corporation

Revolution board to drive the high-resolution graphics monitor, a Microsoft mouse to manipulate the menus, and a JVC video camera with zoom lens.

Face Value

The original art department concept was a video image "painted on" a monitor. "We wanted to use a face," explained Kunkel, "because that's the best representation of what a video capture system is able to do."

Incidentally, the face on the cover is not that of a professional model but that of one of our assistant art directors who had served as a test model to allow the art staff to preset the computer for flesh tones. However, a video digitizing camera doesn't often convey the subtleties you get with a conventional camera. Therefore, says Kunkel, when the professional model was photographed, "her flesh tones were so nice and even that she went completely flat. When we realized the model was not working out nearly as well as tested the day before, we brought our original test model back."

Once they had a usable image, Kunkel did some minor retouching to make it look a little bit more lifelike. He darkened the line on the eyes, brightened the color inside the iris, and made the lipstick redder. "It was done with Chorus Data's *IMIGIT* software," he says. "The interesting

thing about *IMiGT* is that it's built upon Media Cybernetics's *Halo* primitives, routines that enable the computer to carry out such functions as filling in an area with a

color."

Freelance photographer Dennis Kitchen photographed the final image in the conventional manner from an Electro-

home high-resolution analog RGB monitor. The image was then sent to a composition house that combined the photographs of the monitor, the video image, and the paperhanger. After some slight retouching to get rid of awkward edges, the cover art was ready.

Fine-Tooth Comb

The *raison d'être* for all this artistic creativity is a set of fine cover stories on video boards based on thorough hands-on reviews by *PC* regulars Glenn Hart and

"We could have gone to an outside firm and asked it to create the image for us, but then we would have lost creative control."

Jim Forney. The 25 boards they looked at range from sophisticated graphics boards to PC color/graphics board clones—in fact, every new piece of hardware that the authors could possibly lay their hands on. (According to Hart, "If it's a video board and you could plug it in, we asked the manufacturer for it.")

In addition, David Powell explores how PC graphics can be used in broadcasting, and Jim Forney reviews the PC-EYE Video Capture System. The art department does, of course, fully intend to give back the system now that it's finished playing with it. Our art directors would never hold on to it any longer than they absolutely needed to. There are, perhaps, a few short tests they still need to perform. It may take them another day or two, maybe several weeks, but they will return it. Eventually. ■

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There are rules: We can make this offer in the U.S. and Canada only. For you to be eligible for refund or credit, we must receive your returned product within 30 days of its shipment. Everything but the packing must be in our judgment to be 100% resalable condition.

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CODE SIFTER

Find the Hot Spots in Your Program

Fast is never fast enough; only miracles need apply. That's what's expected in today's marketplace, so our Code Sifter is an important tool to add to your workbench.

Code Sifter finds the trouble spots in your program. On its own, it will divide a COM or EXE file of any size into thirty-two equal partitions. Alternatively, you can specify the partition boundaries with addresses, or with symbols if your linker has produced a symbol map. Then tell Sifter to run your program. It samples your object file at precisely timed intervals and counts how many times it finds the instruction pointer in each partition. Job done, it reports the number and percentage of hits in each partition.

You are in for some surprises when you discover just how unbalanced the activity is likely to be, and that's why Code Sifter is so valuable. It profiles just where you can best spend time optimizing your code, or even converting to assembler subroutines.

Code Sifter has a number of monitoring options. You can tell it to include any combination of your program, DOS, and BIOS in its analysis. You can specify the sampling rate. Most importantly, you can tell Code Sifter the number of times to run a program, and between each run discard the less active ranges and re-pursue the hot spots, so that you zoom

in ever tighter on small areas of code. Right down to the last byte! Literally. Try it on the sample program that comes with your disk.

Code Sifter. It will give you the racer's edge.

Product Code: N3100#

Price: **\$119**

SOURCE CODE FOR SALE

Designer Originals For Your Special Needs

"One size fits all" turns away disappointed customers. When you cannot shoehorn your application into out-of-the-box software, we have the solution. For each of these products only, PC Brand now licenses source code, provided you buy (or have already bought) from us the object code counterpart. Take it in, let it out, and make it fit snugly to your needs. And, if you are new to C, you will learn a lot appreciating this fully documented code from top designers.

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Test Toolbox #1

Product Code:	Price:
L9100#	\$500
L9102#	\$500
L9200#	\$500
L9850#	125
L9011#	250
L9111#	250
L9240#	250
L9220#	120

If you have ever built a complex system, you know the time loss and tedium of recompiling, rebuilding libraries and relinking modules because a snippet or two of code has changed. Batch files are no answer. You need batches of them to avoid redoing everything indiscriminately.

Instead, imagine making a change deep in a system, and simply telling Lattice's LMK to take over. No further thinking or keystrokes. LMK will rebuild your final product, however involved and complex, by doing just what is needed and no more.

How? You write a command file which expresses bottom to top all the elements comprising your system and all its dependencies: what gets compiled to make what object file using what options; what is built into libraries; what is linked into the final EXE file. Through the life of your system, LMK keeps track of the last time every action was performed. Run LMK and, tracking each branch, it looks only for elements which changed later than a dependent element further along the branch, using date and time information found in the file directory. Any source file newer than its object file, for example. Only those elements and their dependents are re-made. All other instructions are bypassed.

The command file uses a simple, readable syntax — "prog.obj:prog.c \$(HDRVS)" for example, says what source file this object file depends on, and fills the previously defined macro HDRVS into the expression, which here might be a list of files with hardware drivers, or in another case your preferred string of complex options.

LMK does not care what programming language you use; it's not just for C. For that matter, LMK can apply to more than programming. It can be used for any set of tasks which can be accomplished through commands issued to the operating system. Try it for repeated re-assembly of lengthy documentation, or for selective re-consolidation of spreadsheets so that only dependents of changed supporting schedules get recalculated.

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Product Code: L2100#

Price: **\$195**

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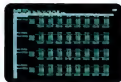
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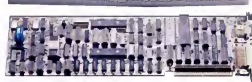
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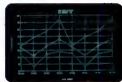
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Diskette Drive	Display
Double-sided, double density	40- and 80-column
Capacity: 360KB	Resolution:
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Processor	Expandability
16-bit 8088	Open architecture
Keyboard	Optional 128KB
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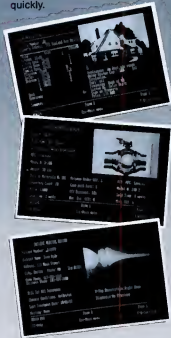
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IBM News

FROM THE EDITORS OF PC

FEBRUARY 19, 1985

New Disk Developments: Power Promises for PCs

The marriage of computer and laser technologies is celebrated at Washington convention.

BY ARIEL SCHWARTZ

WASHINGTON, D.C.—It is a union as inevitable as Romeo and Juliet, as Hero and Leander, as Laverne and Shirley. Video and computer technologies are inching ever closer to one another, blurring their distinctions like a poor videotape blurs the pictures. The two post-World War II technologies share the science of creating and controlling tiny bits of electricity. And the 1984 Videodisk, Optical Disk, and Compact Disk Conference and Exposition held here presented a sharp picture of the exciting devices possible when the two technologies are linked.

Sponsored by Meckler Publishing, the conference covered the video, audio, and data uses of laser and optical disks. The big news this year was that most new computer-oriented products were compatible with the PC, instead of with Apples, as in years past.

The most remarkable new product was Hitachi's CD-ROM drive, which looks like an industrial-grade version of consumer audio's popular compact disk (CD) players. Like the audio disks, the CD-ROM disk is a 4½-inch shiny silver platter of digitally encoded plastic. But unlike the audio CD disks, the CD-ROM disk is strictly for data encoding, holding up to

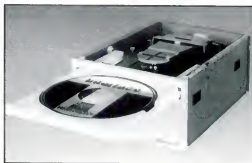
552 megabytes of memory per side—the equivalent of over 1,000 floppy disks or 275,000 pages of text.

That's enough to knock anybody's socks off, but keep in

per disk in quantities of 1,000 or more. That cost could be acceptable for large Fortune 100 companies, but probably a little steep for the smaller businesses. The technology lends itself per-

from track to track and an average total access time of half a second.

The disk player itself will be available as a standalone peripheral or as a subsystem to be installed into a PC just like a floppy or hard disk drive. Hitachi is currently working on the special controller board, called an SCSI (small computer systems interface) connection, and the applications software the CD-ROM will require to work with the PC.



Hitachi's CD-ROM drive reads up to 552 megabytes of data from each side of a removable 4½-inch compact disk. It can fit into an IBM PC's drive slot.

mind that this technology is read only memory, which is why it's referred to as ROM. The disks are mastered like regular compact audio disks and then copied, which are said to be as good in quality as the original, are pressed from the master.

The Master's Voice

Hitachi estimates that the preparation and mastering of the data to disk will cost about \$5,000 per disk and the replication costs will be about \$4 to \$5

per disk in quantities of 1,000 or more. That cost could be acceptable for large Fortune 100 companies, but probably a little steep for the smaller businesses. The technology lends itself per-

fectly to large fixed databases that can be committed to a read-only disk and then produced in quantity. For example, if Lotus's 1-2-3 were put on a CD-ROM disk along with some enormous database like the entire Dow Jones stock profile for the last 20 years, you would have a resource/applications program combination all on one self-contained disk that can be accessed very fast. The Hitachi unit has a seek time of only 1 millisecond

Private Label

At first, Hitachi plans to offer the CD-ROM drive only to original equipment manufacturers, who will put their own brand names on it and package it in their own computers or standalone units. The CD-ROM player will sell to OEMs for about \$500 and should be available this quarter.

Other CD manufacturers such as Sony, North American Philips, and Denon are also readying their own CD-ROM players which should sell for around \$300 to \$500 to OEMs and for about \$500 retail. Of course, as the market expands, these prices will drop.

ANSI standards for CD-ROM technology are nearing completion. They specify 550

(continued)

Disk Developments (continued) megabytes of memory, although several manufacturers plan to put 600 megabytes on their disks. Unquestionably, the appearance of this new CD-ROM

format, you can mix and match any combination of inputs, and so a typical disk could contain 15 minutes of motion video imagery, 25 hours of compressed digital audio, and still have



Laserdata's PC TRIO system links a PC and a videodisk player with a color monitor. Its disks can contain both computer data and visual images.

technology will enormously enhance the PC and will probably change the nature of personal computing.

Several manufacturers at the Conference talked about read/write optical data disks, but no working prototypes were on display. Perhaps next year's Conference will show read/write optical data disks as a working reality.

Laserdisk Gigs

Other items at the Conference of interest to PC users included Laserdata Corporation's demonstration of a laser videodisk-based data storage system built around the IBM PC. The Cambridge, Mass., company's Laserdata PC TRIO system consists of a PC, a color monitor, a videodisk player, and an add-on board that fits into any expansion slot. The board hooks up to any industry-quality videodisk player with a parallel computer port to enable the PC to control the videodisk player's functions. The output from the player feeds into the board, where it is decoded into video or audio signals, or data.

Each 12-inch laserdisk, also a read-only medium, can hold up to 54,000 video frames, 75 hours of compressed digital audio, or 800 megabytes of data—per side. If a videodisk were to be used purely for data, it could hold 1.6 gigabytes of information. But, with the Laserdata

room for 60 megabytes of data—all on one side of a disk. The compressed audio would not match the quality of compact digital audio disks, but would still be very good. When you compare that with a compact audio disk which holds only 1 hour of music or sound, the trade off in quality seems insignificant.

The Laserdata PC TRIO allows you to use the videodisk player as an additional disk drive for the PC, and to control it with its own software. Laserdata supplies MS-DOS file-access routines and makes several sophisticated information retrieval packages that allow word searches and quick access to structured databases.

Laserdata requires you to submit your data on computer tape for premastering set up so that you can properly access the data on the final disk. The mastering can be done at any regular videodisk mastering facility and copies can be produced in quantity.

Video Network

Laserdata also makes the TRIO 110 unit, which has its own built-in 80186 microprocessor. The unit can control up to four videodisk players and will act as a network file server for up to six PCs, offering a total of 3.2 gigabytes of information on-line.

The PC TRIO board sells for

\$1,365, and the TRIO 110 for \$2,950. You must buy videodisk players separately.

Another interesting group of products shown at the Conference was the Visage V-Link series of boards and IBM PC workalikes tailored for interactive video.

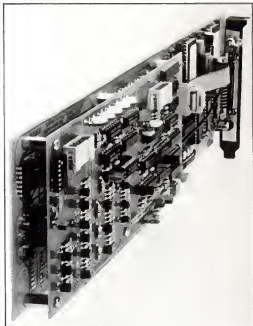
Plenty of Input

The V-Link 1550 board enables you to superimpose PC-created graphics, text, and menus on video imagery supplied by a laserdisk player. The V-Link board then outputs the combined video and graphics image in RGB mode, increasing the clarity of the video image from that of the usually lower-resolution composite - video mode. Control data embedded in the video signal from the videodisk can control the display of graphics and video im-

the videodisk player and to accept a host of other input devices such as touch screens, mice, joy sticks, light-pens, and graphic tablets. Since V-EXEC is a transparent language interface, it will work with programming languages such as BASIC, Pascal, C, assembly language, and even dBASE II. Since it is fully MS-DOS compatible, V-EXEC is expected to work with IBM's new Topview software and Microsoft's Windows.

The strong message from this year's Conference was that IBM PCs and MS-DOS are rapidly becoming the system of choice for all new mass storage and interactive video-audio devices.

As Michael Butler, publisher of the *Interactive Video Technology Newsletter* put it, "We're on the threshold of the second generation of personal computing, when the video-



This V-Link 1550 board, made by Visage Inc., superimposes the text and graphics output of a PC onto a video image supplied by a laserdisk.

agency for a self-contained interactive presentation.

V-EXEC software supplied with the boards is a Virtual Device Interface-based program that enables the PC to control

disk, optical disk, and PC combine to form one system. This powerful new equipment will allow a creative freedom undreamed of a few short years ago. ■

DISCOVERY

AT Speed Thrills On Cheap Crystal

It sounds too good to be true, but a \$5 buy can boost the AT's speed by one-third.

BY BILL HARTS

NEW YORK—It has the ring of a snake oil salesman's pitch: A \$5 part that can boost the performance of a top-of-the-line \$6,000 machine. And, not by just a little, but by 33 percent. Yet that was the report circulating through PC's offices. Hundreds of AT users had juiced up their already high-performance machines by replacing the system board crystal with a \$5, 16-MHz version available on the shelves of most electronics stores.

The trick is simple. The AT's system clock comes from the factory driven by a 12-MHz crystal. This yields a 6-MHz CPU clock. The AT's 80286 processor chip can usually run at speeds of up to 8 or even 9 MHz. IBM rates its components conservatively, so it put in a crystal that did not run the computer at top speed.

The crystal is mounted in a special socket, so you don't have to solder or unsolder anything. In fact, removal and installation can be done quickly and easily with just a screwdriver, prompting many in the industry to speculate that Big Blue itself intends to upgrade the crystal in later AT versions.

Step by Step

It takes only a few steps to replace the factory-installed crystal with the higher-speed one. First, I disconnected all the external cables from the AT, especially the power cable. But, before removing the top cover, I touched something grounded to make sure that I wasn't carrying a static electricity charge.

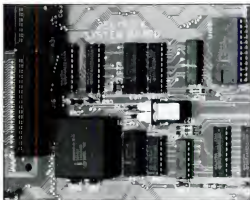
Following the instructions that come with the AT, I removed the cover to gain access

to the system board. The crystal in question is located on the system board immediately behind the 20-megabyte disk drive and is about the size and color of a dime. I carefully worked it free from its socket using a thin, flat-bladed screwdriver, pushing the crystal in the direction of the high-capacity disk drive. This operation should require very little force, and if it seems difficult, you're probably pushing the crystal in the wrong direction.

The replacement crystal should have an HC-18 type case and may or may not have the same leads as the one that is removed. (I used a crystal from a company called NYMPH.) If a crystal has thin wire leads, they should be folded back over themselves to double the thickness and ensure a proper fit in the socket. Polarity of the leads is not important; either wire can go in either side of the socket. Once I removed the original crystal I just inserted the faster crystal, replaced the cover, and then stood back to watch the system fly.

A Word of Warning

I have run a wide range of software on an AT equipped with the new crystal, and experienced no problems so far. In fact, spreadsheets, sorting pro-



The rectangular crystal is mounted at center, above and to the left of the 80286 chip.

grams, and databases all run at an incredibly fast speed. However, I've heard of some people who have experienced balkiness with their AT once they installed a new crystal.

I have not conducted a scientific test and those contemplating replacing the crystal on their own should be very careful. I can't swear there are not some

bottlenecks in the machine that would cause some software or hardware malfunction. Only time and wider use of this technique will tell.

Finally, I can't overstate that replacing the crystal is not an approved practice: Replacing IBM's factory-installed crystal with another automatically voids the warranty. ■

IBM Admits AT Woes

BY CHARLES BERMANT

BOCA RATON, Fla.—In a move that sent ripples through the retailing world, IBM has announced that, owing to an unexpected consumer demand and a shortage of parts, the elusive IBM PC AT will soon become even harder to find. Many industry experts cite hard disk problems as the real reason for the slowdown, however. In a December statement issued to retailers, IBM said that customers will have to wait at least 9 months to purchase the flagship of the IBM desktop line.

IBM spokesman John Pope

said that the AT has "performed well" and had sustained fewer warranty claims than its PC relatives. This contradicted other reports of a high rate of PC AT hard disk troubles. "I've heard of several dealers who have bought ATs without hard disks and installed something more reliable themselves," said a spokesman for Sysgen, which manufactures hard disks and tape backup equipment.

Pope vehemently denied that there has been a high rate of AT hard disk failures. He said that heavy demand and the unavailability of fixed disk and memory components were entirely to blame for the slowdown, which "will not be long lasting." Pope had no comment as to why only one firm, Computer Memories of Chatsworth, Calif., was manufacturing fixed disks for the AT, or on whether IBM was seeking vendors to take up the slack. ■

Warning! Warning! Warning!

PC Magazine does not encourage you to change the crystal in your AT. In fact, you will void your warranty if the machine is returned for service with the replacement crystal. Moreover, if you fail to follow proper safety procedures, you could harm yourself or your machine. The replacement crystal has not been thoroughly tested, and PC cannot verify that all software and hardware will run properly with it in place.

—Ed.



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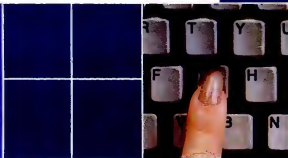
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CIRCLE 437 ON READER SERVICE CARD

News In Brief

Patent Problems...Tandon Corporation, a disk drive manufacturer in Chatsworth, Calif., has filed a complaint of patent infringement with the International Trade Commission (ITC) against three Japanese companies and their United States subsidiaries.

Tandon has charged **Mitsubishi Electric Corporation**, **TEAC Corporation**, and **Sony Corporation** with infringing on the Tandon patent on its disk drives. According to a legal counsel for Tandon, the company has asked for a thorough investigation of the offending companies and requested an immediate general exclusion order to bar infringing products from being brought into the United States.

Simultaneously, Tandon has filed a patent infringement suit against the same three companies in the Los Angeles U.S. District Court and is seeking an undisclosed amount of monetary damages.

Tandon claims it might have to increase its overseas operations because it fears that infringing Japanese floppy disk drives will take over worldwide sales this year.

Picture Perfect...Now that Eastman Kodak Company has entered the disk manufacturing market, it's no surprise that the **Polaroid Corporation** has too. Polaroid is manufacturing 5¼-inch and 8-inch floppy disks and has plans for a 3½-inch disk as well.

"We know that Polaroid has a good name and reputation," says **Peter B. Cameron**, general business manager of Polaroid's **Computer Data Recording Systems**, "but we knew we had to differentiate our product from all the others."

Cameron says that Polaroid is offering a unique data restoration service that will be provided free to all Polaroid disk users. In addition to providing a 20-year warranty on the physical life of the disk, Polaroid will have a warranty on the data. "With this service, we will take disks that have been damaged or misused, try to save any salvageable data, copy it onto a new disk, and send it back to the customer."

The 5¼-inch disk come in packages of two for \$10 or a box of ten



for \$50. The ten-pack includes a lever that fans the disk upwards so the labels show. If you are looking for a specific disk, you don't have to flip through the box and handle the disks. A ten-pack of 8-inch disks costs \$60.

A DOS of the Coin...Microsoft officials were miffed when reports of **Hand-Held DOS**, a lap-portable operating system, were leaked to *PC Week* in December. Borrowing a leaf from IBM's book,

Microsoft spokesman Marty Taucher says, "It is our policy to not comment about unannounced products." He would neither confirm nor deny any details of the *PC Week* story that stated word processing, spreadsheet, and communication software was being developed in a chip format and would be introduced in conjunction with a lap computer this year.

Taucher would not say if that computer would be from IBM, but he did concede that "one of our OEMs leaked the information to the press. But, any reference to this product is premature."

LAN-ing for The Future...Local area network pioneer **Novell** has called its recent 23-station cooperative COMDEX system a success, with company president **Ray Noorda** saying, "It worked so well that it scared me." Noorda, who heads the Orem, Utah, hardware, software, and consulting firm, said that Novell took a tremendous risk implementing the untested system, used in conjunction with a 3M broadband network. But it was, he adds, "the right time to participate in the broadband industry."

3M and Novell put the network together only weeks before the show. It successfully applied infrared transmission, which, Noorda says, will soon be as economical as stringing a cable across the street.

But, inevitably, there were a few glitches. A labor misunderstanding resulted in an all-night installation session, and Novell found that the machines needed to be turned on one at a time. AT&T, the biggest participant, dropped out days before the show because the setup wasn't "giving their products enough attention," according to Noorda. Furthermore, the trivia game designed to interest participants in the LAN left them with very little understanding of the system's capabilities. "The technology got lost in the trivia game," Noorda says. "Next time we will make it a little more business-oriented."

"Next time" won't be the upcoming Atlanta COMDEX, which Noorda says Novell is ignoring in favor of Softcom to "work with the software industry more specifically and help set its standards."

Rules for Dealers...Computer dealers are finding that there's more to their business than ABC. To ease the growing pains of the complex young industry, the **Association of Better Computer Dealers (ABCD)** in Lexington, Ky., an organization that certifies dealers, announced that it has tightened its membership rules.

Under the new rules, only authorized dealers can sell products manufactured by vendors, following authorization contract rules. ABCD dealers may not sell through the mail or over the telephone. They also must accept responsibility for service and support. They must have a service department with adequate spare parts and should also service products bought from other ABCD dealers.

The new rules may seem a bit tough, but Dinsmore is quick to point out the benefits to dealers who can pass muster. "An accredited program, if credible, should add substantial luster to an industry dealership who says, 'I am an ABCD member.'"

—compiled by Jane Mintzer



Ray Noorda

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Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

Surplus, 386, 387, 388, 389

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PRODUCT REVIEW

Mind Altering Software: Do You Want to Trance?

Relax—and let the PC be your guide to self-hypnosis and subliminal suggestion.

BY COREY SANDLER

Subliminal Suggestion and Self-Hypnosis Programs for Your Computer

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List Price: \$68.95 plus \$5 shipping

Requires: 64K RAM, monochrome or color/graphics adapter.

Your eyes are getting heavy. Your limbs feel like lead. You're getting sleepy. And you find yourself dreaming of that special hidden beach on the south shore of Nantucket. Suddenly, work seems a million miles away. And it's all thanks to your PC.

No, I'm not talking about falling asleep in front of your monochrome monitor as you wrestle with the forty-seventh version of your never-ending search for the perfect financial model for tube top futures. I am talking about a new piece of software with the awkward title of *Subliminal Suggestion and Self-Hypnosis Programs for Your Computer*. Luckily, despite the name, it turns out that the software is for computer users, rather than for the hardware itself.

Three Modules

Subliminal Suggestion and Hypnosis Programs consists of three modules: Self-Hypnosis, Subliminal Suggestion, and Relaxation Exercise.

One problem faced by this program—but perhaps it's actually a selling point—is the general misconception about what hypnosis and subliminal suggestion really are. Modern psychologists generally do not consider hypnosis to be the trance-

like "sleep" of Hollywood fame. Hypnosis could more accurately be described as a state of deep mental relaxation and concentration, in which the subject is fully aware of surroundings. The key is to remove—as

moving through a tunnel. According to the authors, the boxes begin moving at a rate just below the "alpha" brain wave level, and then slow down to the "theta" level, which is said to be the most conducive to a hypnotic state.

Alpha Bits

After induction, the suggestion you've chosen will begin flashing on the screen, and, according to the theory, enter directly into your subconscious mind. The authors promise that the program will beep to bring you out of your hypnosis. If it doesn't, a ringing telephone (what, you unplugged it?), an alarm clock, your landlord, or

petitions in an 8-hour day. The barely perceptible message is said to slip in around the edges while your conscious mind devotes itself to that financial model.

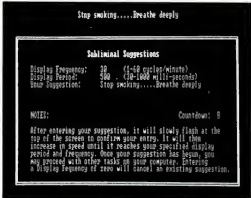
In this program, you create a one- or two-line message and choose a frequency and a display duration. The minimum is 30 milliseconds, which makes the message just barely visible if you stare hard. (The high-persistence green phosphor used on some monitors makes for a ghostly afterglow.) The program is supposed to remain as an overlay to DOS once you boot up for the day, flashing away until you clear RAM with a reset or by shutting off the power. I found, though, that the message display couldn't fight its way through certain programs, among them a compiled BASIC telecommunications package. The message kept flashing when I went into *WordStar*, but the phrase was in the same location as the word processor's status line at the top of the screen, perhaps obscuring the message.

Screen Stares

Will the program work to convince your boss to give you a raise, or your cute colleague to give a date? Leaving aside the serious legal and moral issues this raises, you'll have to deal with a few practical matters.

First of all, you'll have to convince him or her to sit and stare at the screen. And then, the suggestion has to be one that reminds rather than convinces. And, if your victim figures out what you're up to, the consequences might not be worth the possible reward. You might do better with flowers, candy, a new outfit, or a Caribbean vacation.

Authors Michael Anderson and Lanny McKinnon offer a few titillating comments in their instruction manual, wondering whether some American businesses have not already incorporated subliminal suggestion into their plans of operation. Gee, I wonder if they introduced a hidden suggestion into the disk they sent me. Buy this program. Buy this program. Buy this program. ■



Why struggle with smoking urges? Let your PC share the burden of keeping you honest.

far as possible—sensory input from the here and now and replace it with thoughts and senses that are deemed more valuable.

The Self-Hypnosis module is described in the manual as an "automated" session. The authors suggest dimming the lights and unplugging the telephone to assure concentration. Answering questions posed on screen, you choose the length of the "induction count," the suggestion period, and the message. The induction count is the computer equivalent of the swinging gold watch: on the screen, the program presents a cascading series of rectangles, drawing the eyes inward from the screen to a numeric countdown.

The effect is something like

something is sure to wake you. I tried the hypnosis program late one night and found the exercise a bit tiring. My mind drifted, my head bobbed, and I felt myself quite alert before the beep sounded on my computer. I shut off the computer, went to bed, and slept right through three middle-of-the-night feedings for the baby. My wife didn't think it was all that funny when I congratulated her in the morning on not having to get up for a milk run all night.

It turned out to be more relaxing than the Relaxation Exercise module, which merely presents pulsating images on the screen.

The advantages of using a computer to send subliminal messages is the machine's tireless ability to repeat a message: it can display up to 30,000 re-

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 Trademarks: On-line: Hercules, Graphics Pak/Hercules Computer Technology: IBM, AT/ International Business Machines. Notes: (1) An adapter is supplied for composite video. (2) The IBM Color/Graphics Monitor Adapter must be removed from the *Portable* before the Hercules Color Card is installed. (3) Model G1001 or later. (4) Based on the list price as of 7.1.84 for the IBM Color/Graphics Monitor Adapter.

WordPerfect 4.0. Our

The process of perfecting word processing.

At SSI, we're not in the habit of resting on our laurels. Even though the overwhelmingly positive response to WordPerfect has tempted us to do just that, we just don't. Instead, we spend our time making WordPerfect even more perfect.

WordPerfect 4.0, our newest edition, is the result of all that work. With the input of users and dealers, we have added several important enhancements and features to WordPerfect, making 4.0 the most perfect WordPerfect, yet.

included in WordPerfect's base price... is a 30,000-word speller

InfoWorld Magazine

Expanded and improved.

You may not have been satisfied with WordPerfect's 30,000-word dictionary. And neither were we. So, WordPerfect 4.0 includes a new phonetic dictionary with 85,000 words (which take up less space on the disk than did 30,000 pre-



viously). Plus, the new dictionary includes a document word-count feature and the ability to search entries using any letter in the word.

this fall we can expect new WordPerfect features such as table of contents and index generation

PC Magazine

Right on time.

WordPerfect 4.0 features automatic generation of indexes and five types of tables, including table of contents. You simply mark words to appear in the desired tables, and generation is accomplished with just one keystroke.



Footnoting is a good example of WordPerfect's sensible style.

Business Computing

Sensible, but not good enough.

The same footnoting capabilities garnering much praise for WordPerfect are even more enhanced in WordPerfect 4.0. Now lengthy footnotes can span multiple pages, and footnotes can be placed either at the bottoms of pages or at the end of the document. In fact, footnotes and endnotes can both be used in a single document.

Earlier versions of WordPerfect were plagued with poorly organized documentation.

Softalk Magazine

We agree.

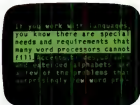
The documentation for WordPerfect 4.0 reflects a great deal of reorganization and improvement. Following a number of suggestions

highest marks yet.

from users and after extensive testing of the new format, SSI is excited to introduce this significantly enhanced documentation package. Many new diagrams have been added and tutorials are more extensive. In addition, the reference section is expanded and better organized for ease of use.

The program does not adequately mark text slated for deletion or movement. The block ought to be highlighted.

InfoWorld Magazine



Makes sense.

A new block highlight feature of WordPerfect 4.0 lets you know exactly what block of text you have defined.

The program would be enhanced if it regularly saved text to disc.

InfoWorld Magazine

Done.

WordPerfect 4.0 allows you to set desired intervals for automatically saving text.

And there's more.

Other WordPerfect 4.0 enhancements include a new template with commands consolidated in the function keypad; enhanced printer management; a network version of 4.0 supporting selected networks; an auto-date insert feature; a cursor definition capability; automatic paragraph numbering; automatic outlining; and redline and overstrike printing.

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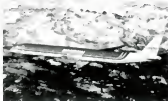
New customer service policy expected to set a new standard in the mail order industry!

BY MICHAEL CHRISTOPHER

GARDEN CITY, N.Y.—Mr. David W. Pasternack, President of Logisoft, a major IBM PC software and hardware distributor, has announced the inception of a unique new customer service policy. . . . free overnight courier delivery on their entire product line.

In a recent interview, Mr. Pasternack stated that "We feel our new free overnight delivery service will set a new standard in the computer software mail order industry. In a study we conducted, we found that in addition to competitive pricing, expedience was a factor utmost in our customer's minds. Whether their order was \$300 or \$3000, the need to get their package as soon as possible was the same. Under our old procedures, between processing and shipping time, it could take up to a week and a half to two weeks for an order to arrive. With our new courier service, an order can be processed, shipped, and arrive in our customer's hands in only 3 working days. . . . at no additional charge!"

The company is using Emery Worldwide to handle the large number of packages being shipped each evening for next day delivery. "We chose Emery for their competitive pricing structure and excellent delivery record", said Mr. Pasternack. Emery was quoted as saying, "This makes Logisoft the largest single Emery account in the New York Metro area."



LOGICTP OF THE MONTH

Choosing software can be mind-boggling. With the proliferation of publishers, how do you choose. Analyze your needs. . . what specific tasks do you want to perform. Read the software reviews; an excellent way to evaluate a package. Ask around. . . you'd be surprised how many associates may be using a package similar to your application. Finally, choose the best package (not always the most expensive). Upgrading will end up costing you more. Remember the key word is research.

TOLL-FREE SUPPORT A Smashing Success

GARDEN CITY, N.Y.—A survey of Logisoft's toll-free technical support policy was done to see if it warranted the continued costs of the 800 toll-free number, personnel costs, etc. After careful monitoring of these calls (both pre-sale and after sale) it was found that 92% of the calls were for legitimate technical support questions rather than for answers already contained in the softwares' operations manual. As a result of the survey, the decision has been made to continue toll-free support as an important part of their customer service.

This service consists of assisting with: • Hardware requirements • Initial boot-up procedures • Initial software configuration (printers, disc drive, etc.) • Back-up procedures • Defective program determination • Alternative program recommendation • Return policy

Logisoft's Lowest Price Guarantee Still Effective

GARDEN CITY, N.Y.—Logisoft, Inc. has indicated that their long time policy of guaranteeing the lowest prices in the mail order market is still being offered and will not be affected by their new free overnight delivery service. "We will continue to beat any price by \$10" a company spokesman said. "We'd be crazy to fool with success", he stated; "since the inception of our lowest price guarantee, sales have skyrocketed."

When asked how Logisoft could afford to give their customers free overnight delivery plus beat any price by \$10, they replied "Buying Power". "Very simply", they said, we buy at the best possible prices and pass those savings along to our customers."

CONTINUOUS STATIONERY: BIG BUSINESS, But "Where's The Class?"

NEW YORK—The growth of Logicforms, Inc., a member of the Logic Group, has been phenomenal. Mr. Ralph Corso, President of Logicforms explains why. "Up until now, buying continuous stationery through the mail has been a take what's available situation". "First off", he said, "almost all mail order firms offer only stock letterheads & envelopes with limited typesets, colors and stock logos from which to choose, but, 'where's the class?'"

"The individual style and design of a letterhead", said Mr. Corso, "reflects the professionalism and personality of a company and should not have to change because they now have a printer and the need for continuous stationery. While other mail order firms are limited in the variety they can offer, Logicforms specializes in custom stationery. Logicforms offers a large selection of quality paper, ink colors and special effects such as thermography, blind embossing, foil stamping and multi-color printing." Mr. Corso went on to say that

"whether a customer chooses to supply his own artwork or printed letterhead, or wishes to select from our vast array of stock designs. . . . We are the Logical Choice."

For a free sample/pricing kit and a handy re-usable shipping envelope for artwork, simply call toll-free 1-800-645-3491 or send a sample of your current stationery for a free firm price quote. Mail to Logicforms, Inc., 300 Garden City Plaza, Garden City, N.Y. 11530

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PROFILE

Taking a Close Look At IBM's New Role

Automation's author points to IBM as an example of his newly coined term.

BY MARTIN PORTER

NEW YORK—If John Diebold has a singular talent, it is his ability to spot a management trend and give it a name. He proved this over 30 years ago when, at the age of 26, he coined the term "automation" in a book of the same title.

Today, as the chairman of the Diebold Group, a management and technology consulting firm for the Fortune 500, Diebold is still creating names for business phenomena and making one for himself in the process. In his latest book, *Making The Future Work* (Simon & Schuster, 1984), Diebold has devised a new term, "intrapreneurship," to describe an emerging management trend, one that matches the organization of IBM's Entry Systems Division (ESD), which produces and sells the IBM PC.

Diebold defines "intrapreneurship" as follows: "Setting up a small, independent division under the corporate umbrella that is, by all appearances, an entrepreneurial start-up, but is, in fact, a company within a company."

Bold Intrapreneurs

Obviously, the success of ESD and its PC family hasn't been missed by business managers; calculated risk taking and "close-to-market" decision making are characteristics of many business behemoths trying to move quickly with the times. Diebold agrees that the success of ESD has encouraged other corporations to take the "intrapreneurial" route. As a success story, however, he says ESD uniquely illustrates the predicament of a corporate start-up that itself grows into a giant.

"A big company has tremendous problems when it tries to maintain a condition of very



John Diebold

rapid growth along with an environment where people can take risks," Diebold explains. "The important thing is to establish an environment where employees can not only take risks, but where, if they fail for a perfectly good reason, they haven't killed their career."

IBM is a company Diebold seems to savor with a connoisseur's eye for management

skill. He feels IBM has already taken a significant lead in the race for future technical opportunities because of its ability to sustain the intrapreneurial spirit. It is in this respect that IBM's competitor in the PC market, AT&T, has yet to prove itself a vigorous competitor.

"I think you are starting to see this emerging attitude from AT&T," Diebold says. "I think AT&T has already made big strides. But it has a long way to go."

Risky Business

So does the rest of the industrial world, for that matter. Diebold feels that European and Japanese companies both have inbred traditions that preclude the creation of intrapreneurial units. "Their whole society works against risk taking, against innovation of that kind. Failure is anathema to them. If you are a young person and you try some innovation and you fail, your career is blotted for the rest of your life."

Diebold encourages corporations to make changes of this type, for the sake of a better society and a more profitable bottom line. He has modeled his own New York City business upon these management beliefs. With an assortment of IBM PCs and Wang word processors, his staff analyzes and produces reports for nearly 700 assignments per year. Diebold coordi-

nates seven international offices and collaborated on his new book with a "telecommuter" who shuttled the manuscript between New York and Boston by wire.

White-Collar Change

Office technology creates organizational changes of its own, Diebold says. The coming age of artificial intelligence is expected to impact the jobs of white-collar workers the way industrial automation altered the blue-collar ranks. However, Diebold's theory of automation is less apocalyptic than other technical oracles: "The only way to save jobs is through automation," he declares. "If we don't do it we will be driven out of a lot of fields. Computers change the way you do your job. They change the job you do, and they change the society in which you operate."

Diebold recognizes the dichotomy posed by technology in the workplace—dehumanization versus freedom. It is for this reason that he describes IBM's selection of a mustachioed-tramp with baggy pants as a "brilliant choice" for the PC ad campaign.

"The concept of the 'company man' or 'organization man' is outmoded. Today's emphasis is on individual self-discovery and expression," he notes in his book. Meanwhile, his pet suggestion to corporate managers these days is: "Treat talent as capital."

Even prominent industry consultants have "off days," however. Diebold used the success of IBM's Entry Systems Division to illustrate "intrapreneurship" at work in a recent interview, but his book takes Convergent Technologies as a principal example. He describes at length the launch of the WorkSlate, which, like the PC, was rolled out the door in only 1 year by an independent business unit within a large company.

"Intrapreneurship" doesn't guarantee success, it appears. The lap computer offspring of Convergent Technology's "intrapreneurial" experiment has since been mothballed because of lackluster sales.

Where There's a Will, There's a 'Ware

Is there personal computing after death—or only Worm Processing?

The closest thing to software for the afterlife may be a program that helps you create and print a statutory will and trust that's valid in the state of California. This piece of public-domain software has a name that sums up both its noncommercial status and its function: *FreeWill*.

FreeWill is available from the San Francisco PC Users Group's software library for \$6. Ask for disk 51 when you write to 4411 Geary Blvd., Suite 33, San Francisco, CA 94118.

According to software librarian Charlie Vella, *FreeWill* started out as a user-supported program, with a requested donation of \$10. Letters and payments sent to the address listed in the program, however, were returned with no forwarding address—an ominous sign!

In any case, a do-it-yourself, last-will-and-testament program may not be viable as a user-supported product. By the time there's evidence that someone used the program without payment, that user is far beyond the reach of the program's creator—but closer, perhaps, to the Creator.

—James Langdell

Okay, okay, okay. If you're going to insist on specifics, we can tell you outright that The Shoebox Accountant retails for \$395. We realize we can probably disclose this detail without appearing too pretentious, simply not mentioning that for this incredibly marketable price, The Shoebox Accountant offers a totally integrated small business accounting system, complete with tutorial, queuing files, and CYMA's powerful reporting capabilities, and capsulizes the complete system on a single diskette. After all, as our professional peers, you're entitled to a little inside information. But you know us: subtlety is our hallmark.

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MAYDAY! Answers Emergency Calls

Tap into a troubleshooting hotline dedicated to computing problems.

BY DEAN HANNOTTE

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AVON, Mass.—Third-party hardware support is familiar to everyone who doesn't send all their appliances to the factory for service. Now, the third-party concept has crossed over into software with the advent of MAYDAY!: The Software Support Service.

Picture this: You're trying to get your favorite word processor to add italicized footnotes to your request for a raise. But try as you may, it just won't do what the manual says it will. Do you call your dealer? No. It's Saturday, they'll only put you on hold anyway, and the brat who answers the phone reminds you of your nephew.

How about the vendor? That's a good idea—if you can find them and someone actually answers the phone. Of course, to read the fine print in the warranty, you'd think that if you open your mouth, you'll probably get sued for damaging their diskette.

MAYDAY! was damaging for times like these. It offers a friendly voice you can reach 18 hours a day, 6 days a week, for those times when you're sure you've followed the directions, nothing you try works, and you're ready to toss your computer out the window and into your neighbor's badminton net.

Naturally, nobody and nobody's army could ever be experts on every package ever written for every computer. So

Teletech concentrates on the "Top 40" microcomputers, beginning with the IBM PC. For operating systems, they stick to MS-DOS and CP/M. And for software, they focus on the most popular spreadsheets, word processors, and home applications—350 in all.

Although MAYDAY! is actually a service contract, you'll find it at your local computer store deceptively packaged in the same kind of box that software is usually sold in. And, like software, you get "documentation" too—in this case, a standard IBM-size three-ring binder containing the MAYDAY! Primer and Troubleshooting Guide.

The illustrated and well-written Primer covers the sorts of things every computer user should know. Its intent is clearly to save the customer (and Teletech) some unnecessary phone calls. Chapters include "A Whimsical History of the Computer," "Housetraining Your Computer," and "Software Needs Love, Too." You're not contractually obligated to read every sentence.

You also get a glossary that defines "terminal" as "a large building where computers take off and land," "menu" as "all you can compute for \$2.99," and "binary" as "a transsexual canary." The glossary you won't need.

The Trouble Shooting Guide

Speaking of Computers: Everything Must Go!

Regarding IBM's introduction of the AT: "Companies called us and asked, 'What can we do with our old XT's?' Our answer was sell them to your employees, send them to Africa, but get them the hell out of the states."

—John Levy, vice-chairman of General Micro
(a midwestern chain of computer retail stores)

holds tips concerning known glitches in *Accounting Partner*, *Accounting Plus*, Microsoft's *BASIC Compiler* and *BASIC Interpreter*, *CalcStar*, *CROSS-TALK*, *dBASE II*, Lotus's *1-2-3*, *MBASIC*, *MultiPlan*, *Perfect Filer*, *Perfect Writer*, *R:BASE 4000*, *SuperCalc*, *VisiCalc*, *Word Plus*, and, of course, *WordStar*.

Dial-a-Hacker

What you're really buying, of course, is telephone support time. MAYDAY! costs \$200 for 120 minutes, and you must use this up within a year after purchase. Any one phone call "costs" you a minimum of 3 minutes, with calls longer than that rounded up to the next 15-second increment. You're even given a telephone log so you can keep track of how many minutes you've used. And since you pay for the call, you may want to give some thought to moving to Massachusetts. But if all this sounds pricey, compare it to IBM's telephone service, which charges \$380 for seven phone calls relating to only fifteen products.

Teletech pitches MAYDAY! heavily to dealers ("MAYDAY!" looks just like software," touts the brochure) because it relieves dealers of the considerable headaches of customer support. According to Teletech, Computerland's six Boston stores now bundle MAYDAY! with every computer system they sell, including PCs.

Answering the MAYDAY! hotlines sounds like fun. The pool of 40 or so technicians on the other end have at their command a database of 20,000 previously solved problems. In many cases, your answer is only a few keystrokes away. If the answer isn't found in a few minutes, however, you hang up while the technician digs

deeper. You're guaranteed a call-back within the hour, either with the answer or a fascinating explanation of why your question is such a good one. Theoretically, you always get an answer, even if it takes a week.

Actually, this unique database predated the MAYDAY! concept. It was developed by Software Wholesalers, headquartered in Massachusetts. In distributing 300 software packages to 2,000 dealers, it found itself answering the same questions over and over again. So an ad hoc database of solved problems slowly grew. In 1982, the idea of making this treasure trove available to users in addition to dealers was born, and earlier this year, Teletech Service Corporation and MAYDAY! were the results.

And what if it turns out that your word processor can't do italicized footnotes after all? In that case, you might be tempted to ask if you should have bought another word processor. If they happen to know the answer, MAYDAY! technicians will gladly tell you. In fact, a speaker for Teletech predicts that eventually the meaning of "software support" will expand to include answers about software in general, and even help in configuring a new system.

Limitations

For now, however, MAYDAY!'s software base won't satisfy everyone. IBM's *BASIC* compiler is not supported, and neither is IBM's *Personal Editor*. For some reason MAYDAY! doesn't support any software supplied by any computer manufacturer—only third-party software. So, if you run into trouble with the *Personal Editor*, or *WordProof* (IBM's spelling checker), or any other IBM product, you're right back out on a limb.

Although MAYDAY! may not yet patrol everybody's territory, and though it can't actually fix any software bugs it finds, it can still provide valuable hand-holding to anxious newcomers who hark to the software standbys. If Teletech's claim of 10,000 sales a month is accurate, a new information utility may be in the making. ■

FOR \$30 YOUR COMPUTER WILL RESPECT YOU IN THE MORNING.

Your computer thinks you're a real moron. So do the big-ticket software packages like Symphony, 123, Wordstar, etc. Every morning, when you boot your IBM PC or compatible, both hardware and software treat you as if you had a two-digit IQ and the reflexes of a turp.

First, you plod your way through all those nested menus. Once into your application, the software thinks you're too ignorant to care about multiple-keystroke commands. And the hardware assumes a screen cursor that moves at ten characters per second is the fastest thing you can handle.

Even before you invoke insulting software packages, the system assumes you are one lousy typist who can't possibly exhaust the capability of a 16-character type-ahead buffer. If you do get more than 16 characters ahead, it just throws all those characters away. But then, someone as stupid as yourself can't possibly be doing anything important.

And heaven forbid you should want to leave your computer unattended. If some co-worker doesn't blither by and inadvertently reformat your hard disk or type garbage into your spread sheet, you should still plan to return soon. Nobody has seen fit to protect the phosphor on your screen with a blanking mechanism.

ANNOYING MOTHER JONES' SON'S SOFTWARE

About thirty-two years ago, Mrs. Jones was just getting over a large bellyache. She gave birth to a son, Morris. Several months ago, Morris got rid of a large bellyache of his own. He gave birth to about 2000 lines of assembly language code that slapped a little respect into his computer. For \$30 you can adopt one of Morris's babies. For a little more, you may even have the source code. Then you can really do some *genetic engineering* on your rude little bucket of sand.

We call the package "MJ." It gives MS™-DOS much more respect for you. A serious *attitude adjustment*. It downright burns new synapses into Symphony, 123, Wordstar, and every other package we know of. It even gives Sidekick a kick in the rear end.

If you spend any time at all on your IBM PC or compatible, can you afford not to spend \$30 for a little respect from your computer?

MOTHER JONES' SON'S SOFTWARE PEDIGREE

Morris Jones' brilliance became legendary at Amdahl. Singlehandedly, within ninety days, Morris wrote the design-entry and simulation program that produced the Amdahl 5860. That accomplishment earned him the title of *principle engineer*. There were just a few such individuals in all of Amdahl. As you might guess, there's now one fewer.

As for MJ's 2000-plus lines of PC brain surgery, how good is it? Let's put it this way. Most of the really good silicon surgeons learned assembly language by studying other people's well-written assembler source

ABOUT MOTHER JONES' SON'S BABY

MJ comes to life right after your system does. It co-exists with MS-DOS (2.0 or higher and at least 96KB of memory), Symphony, 123, Wordstar, Sidekick and most of the known Universe of currently available PC programs. You can invoke MJ without leaving your program, and do the following:

1) MJ permits you to open a window and reassign a key to produce up to a thousand keystrokes. Not only can such a redefined keystroke send you from MS-DOS, smoking past Wordstar initial menus and smack into your edit file, but it can eliminate forever those infuriating two-key commands. Suppose you want to turn off hyphenation and justification (so your business correspondence doesn't look like a computer-generated form letter), get rid of the help menus (because you're no Neanderthal), and set up indented margins? Instead of typing

"of 'oh 'h2' of10(c) or50(c)"

you can program one key to do it. If you spend much time in Symphony or 123, MJ will make you equally brilliant. Especially to the local computer wizard looking over your shoulder, trying to figure out how you do so much with so few keystrokes.

2) MJ allows you to speed up your screen cursor in five increments, from the present 10 cps to over 90 cps. If you've spent at least seventy-five cents in a video arcade, your reflexes are more than up to this feature.

3) MJ expands the IBM PC keyboard capture from 16 characters to over 1000 characters. No more beeping, telling you the buffer is full and trashing your input. Your computer will gain new respect for you, as you keep several large steps ahead of it.

4) MJ allows you to lock your keyboard while you take a break. Without leaving your application. So nobody can undo a morning's work. Or a week's. When you return, type your password to bring the interrupted application back to life.

5) And then there's a few miscellaneous things. If you paid your own hard-earned money for a PC, why not protect your phospor? MJ can make your screen go blank after two minutes of screen/keyboard inactivity. So your bank account won't go blank. MJ also makes the control-C, control-S and control-Q keys function properly. Too bad IBM didn't.

code, MJ source code is good enough, tight enough, that we're not at all ashamed to make it available to you. An evening with MJ source code could well beat a whole semester of reading the swill you'll find in the local college book store.

COPY PROTECTION AND PROGRAM LICENSES

If it weren't enough that your system treats you like a moron, how about those absurd copy protection mechanisms? And license agreements you sign, knowing you have no choice but to violate them or risk going out of business?

MJ is not copy protected. We even offer you the source code. Copy the software for your friends, if you wish, provided you send us the discounted price when you do. Here's our individual program license agreement (blanket corporate licenses are available):

You agree to treat this software as if it were a book, with the exception that you are granted the right to make backup copies. You are free to take it to any other computer provided there is no possibility somebody might be using it on your own computer. You are free to loan it to someone, provided you cannot use it while it is on loan. You are free to sell it, so long as the new owner agrees to all these conditions. Unlike a book, you may even copy it and give it to a friend, provided your friend signs this agreement and you send us the full price of the software less the \$10 in handling and processing you've saved us. If you build our source code into your own integrated application, for resale, we won't be unreasonable in negotiating a royalty arrangement.

As for warranties, you may return defective software within thirty days for a replacement. But just like any other self-help book, it is up to you to make it work. No matter how badly it damages your life, or that of your customers and friends, we're not obligated to do anything about it. Now for the ph-terms. Violate this agreement and our attorneys will sue to the full extent of the law. As you know, it is completely unenforceable. Also, you agree that 30 days after you violate this agreement, ownership of your eternal soul automatically passes to us, and we have the right to negotiate the sale of said soul to the first smoking, blood-drained aspen with large (S&B&W) that meets our price. The S&B&W may collect your soul at any time of his/her's choosing.

Given the remotest chance some supernatural entity could actually enforce the "soulcatcher" clause, you'd be a real bazo to take any chances. But then we give you more credit for intelligence than does our competition. So does Mother Jones' Son's software.

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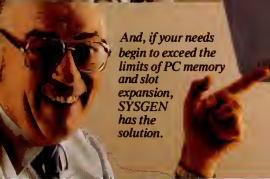
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Buyer's Ed: Taking Demos for a Spin

Watch out for price curves when test driving your next potential program purchases.

BY ERIC FREEDMAN

NEW YORK—The "free home demonstration" of a few years ago isn't necessarily free anymore. At least, not when it comes to demonstration programs available on disks for the PC. With the price of some demos hitting \$25, two questions are raised. Why would anyone buy a demo disk? And what is a company's strategy in selling one?

For the consumer, a good demo disk can provide an extra, and important, dimension of information to help assess a program being considered for purchase.

But why spend money for a demo when the local retailer can demonstrate the product for you? Many PC users don't live close to dealers, and dealers don't always demonstrate all the items they sell. Also, you can spend as much time with a demo at home as you want. And the expense is generally minimal compared to the price of the product; in many cases, the company will credit the demo price toward the purchase of the program.

But why do companies offer demos? After all, most PC software products are either demoless, or offer demos solely to retailers. Companies turn to demo disks for consumers for reasons including competition for shelf space at retail outlets, the inability of retailers' sales staffs to master the subtleties of all of the huge number of programs available, the high costs of alternative marketing strategies, and a demo's potential to sell a product in a way even the slickest brochure or ad can't match.

"It was an easy way for people to see what the product can

do," explained Gene Brown, president of C Source, Inc., which sells *EC Editor* (\$5 demo), a text editor for programmers. "Since we don't distribute through retail outlets, we need a way to show how the editor works. It's an inexpensive way for us to get our product out there."

Quest Research, Inc., president Lawrence M. Beyl said his company decided to offer demos for its *It's My Business* program (\$20 demo) even though it hadn't done so for other items in its line. "Our product has so much in it, we felt the product would tell it for us," SoftCraft, Inc., offers a \$7.50 demo for *Fancy Font*, its personal typesetting program for dot matrix printers. Vice-president Bob Fenchel says, "It's worth our while for two reasons: to get people to see what it does—the quality of its printing—and as a test vehicle."

Beverly Lagas, marketing communications manager for DayFlo, Inc., which sells the *DayFlo* database manager (\$10 demo), said, "We have a rather unique product and we thought the only way potential users could appreciate it is to see it." Lagas added that, "You can't rely on the dealers—who have so many products—to demonstrate yours. Retailers don't like to serve the educational function."

Surprisingly, some companies don't keep statistics on

the proportion of demo buyers who go on to order their product. Others do.

Payoffs?

Kathleen Emerson, president of Design Trends, Ltd., which sells a trio of *SoftTax* (\$25 demo) tax preparer packages, estimates that 25 to 30 percent of the firm's demos result in orders. The company also surveyed those who didn't follow up with a purchase. The most common reasons were that the user didn't try out the demo, in some cases they didn't even have a computer, or they kept it on file for a possible future order.

While most companies haven't ventured into the demo realm, some tried but found the approach failed to meet their expectations.

One of those is Ann Arbor Software, developer of the *Textura* word processing package, which discontinued sale of its \$3 test disk after about 6 months of advertising. President Scott Anderson explained: "We did some follow-up on people who got our demos. A lot of people weren't willing to spend the time working on it." Anderson said about 10 percent of those ordering the demos went on to purchase the program, "but the administrative overhead was a hassle."

Demonstrated Variety

Some demos allow users to input data of their own choosing, but within tight restraints. Others go further. As an example, the *EC Editor* demo is a limited-capacity version of the regular product, enabling users to design and manipulate an 8K to 10K file. "We wanted to give people enough so we can hook them," Brown said. In fact, those who need only a small programming editor may be able to manage with the demo alone, he observed.

Not all companies share that

philosophy. Demos for *DayFlo* and Software Solution's *DataEase* (\$10 demo) offer, in effect, flashy slide shows rather than a hands-on experience. They adequately illustrate the product, but leaves users without a feeling for how the programs respond to commands in real situations.

When asked about this, Lagas explained that the *DayFlo* demo was developed as an "on-line brochure." She said, "We're advertising to an audience that knows what databases are. We wanted it to be a completely hassle-free thing."

Similarly, the *Fancy Font* demo requires no user action other than booting up and calling the two short demonstration files. It then automatically prints the preset text in a variety of pre-ordered typefaces. Some commands are shown, but the user doesn't have the opportunity to input any of them. Fenchel said, "We're unique enough to show what the product produces," making intervention unnecessary during the demonstration.

Documentation

Don't expect a complete users' manual with a demo, although some test disks include them. However, the better demos all have adequate written instructions on booting (generally demos don't contain DOS), major product features, differences between the demo and the full package, price, and customer support information. System requirements should be fully set out in the documentation, and consumers should check them before ordering the package: The demo for one product we checked runs on a PC with two drives, but the full program requires a hard disk.

Of course, demos are not sufficient to evaluate software before buying. They represent, after all, a company's effort to put the most alluring face on its product. Used in conjunction with such other tactics as talking to fellow users and studying reviews, however, demo programs can play a key role in your personal or business software decisions. ■

IBM's Paternal Reaction

Regarding the poor early sales of the PCjr: "It did not perform as well as IBM expected, and they sort of took it personally."

—Dr. Ronnie Ward
Future Computing

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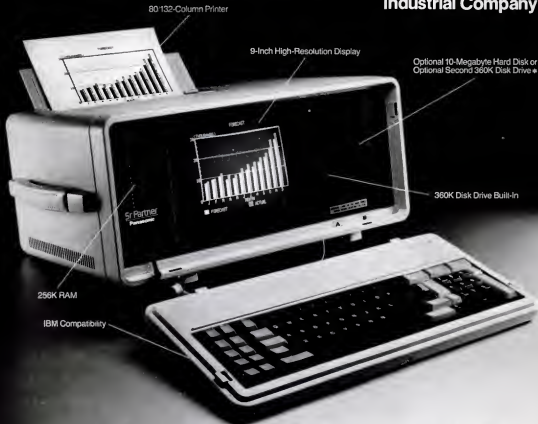
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CIRCLE 140 ON READER SERVICE CARD

A Second Opinion On Diagnostics

Examine half-a-dozen programs that will check out your PC's inner workings.

BY BILL HOWARD

What does a PC diagnostics program have in common with a smoke detector, a life jacket, and a seat belt?

They're all reasonably cheap for what they do (and compared to what they protect)—and too many of us ignore them.

The reason you should know about diagnostics programs has to do with the most common way a computer breaks down: The disk drives gradually go out of whack. Once you get the drives put back in working order, they may be unable to read any of the data you wrote to disk while the drives were going bad.

Fortunately, any of the half-dozen diagnostics programs on the market—costing from \$35 to \$140—should give adequate warning of impending computer woes. They cover different territory from the diagnostics disk supplied by IBM with your PC.

The cheaper programs test only the floppy drives and report the results in plain English: pass, okay but not great, or fail. The more expensive programs add memory, keyboard, printer, and hard disk tests. They're compatible across a range of PC clones, especially the near-duplicates such as those from Compaq or Columbia.

Checkpoints

The programs check some or all of these disk functions:

Disk speed, also called spindle speed. The drive should spin at 300 rpm.

Head alignment, also called radial or track alignment. The recording head should line up directly over the centerlines of the disk tracks. PC disks have 40 circular tracks located 21/1000 of an inch (21 milli-

inches) apart. The drive should write data right down the middle of each track, and at the very least, read anything that's within about 7 milli-inches of being on center.

Disk clamping or centering. If the disk isn't held in place, the read/write head won't be centered over the proper tracks.

Hysteresis, or positioner, backlash. When the read/write head jumps from track to track, it may over- or undershoot the intended track by a hair.

Write/read. A series of random characters are written to disk, then read back. Some test for 10 seconds, others will run all night if you let them.

Erase crosstalk or crosstalk. Little erase heads on either side of the bigger read/write head create the electronic equivalent of a demilitarized zone between tracks. Sometimes, the erase heads inadvertently pick up a stray signal and confuse the drive.

Noise tolerance. Especially

at the innermost tracks, the read/write head may have trouble reading data accurately. Cleaning the head usually solves the problem.

Brief Descriptions

Diagnostics products include Verbatim's *Datalfisk Disk Drive Analyzer* (\$39.95), which runs four tests in about 2 minutes. While underway, it displays cartoonlike representations of the functions under test. Its results are rated good, fair, or poor. You can run tests one at a time with manual retries, or you can let an auto-sequence step through all four. It supplies instructions on a stiff card.

The Dymek *RID*, or *Recording Interchange Diagnostic* (\$34.95), runs seven tests in 25 seconds and reports them back as pass/fail. Instructions are on a single card, and a 16-page booklet explains the tests. You can even get a printout of the results.

Both the Verbatim and Dymek diagnostics programs read and write their test patterns on their own disks, rather than on scratch disks.

Award Software's *Cross-Check* (\$99 and until recently called *PC-Care*) and SuperSoft's *Diagnostics II* (\$125) also test RAM, keyboard, monitor, and printer. *Diagnostics II* has one version for the IBM PC and compatibles, and a generic version for other MS-DOS PCs.

The *Cross-Check* manual is (continued on next page)

Diagnostics Disks For Your PC

Datalfisk Disk Drive Analyzer Verbatim

323 Soquel Way
Sunnyvale, CA 94086
(800) 538-1793,
(408) 245-4400

List Price: \$39.95

Requires: 64K RAM, one disk drive.

Interrogator

Dysan Corp.
Box 58053
5201 Patrick Henry Dr.
Santa Clara, CA 95050
(800) 551-9000,
(408) 988-3472

List Price: \$139

Requires: 64K RAM, one disk drive.

Recording Interchange Diagnostic (RID)

Dymek Corp.
1851 Zanker Rd.
San Jose, CA 95112
(408) 947-8700

List Price: \$34.95

Requires: 64K RAM, one disk drive, DOS.

Cross-Check

(formerly *PC-Care*)
Award Software, Inc.
236 N. Santa Cruz Ave.
Los Gatos, CA 95030
(408) 395-2773

List Price: \$99

Requires: 64K RAM, one disk drive, DOS 2.x.

Diagnostics II

SuperSoft, Inc.
Box 1628
Champaign, IL 61820
(217) 359-2112
List Price: \$125

Requires: 64K RAM, one disk drive, DOS.

Copy II PC

Central Point Software
9700 SW Capital Hwy., # 100
Portland, OR 97219
(503) 244-5782
List Price: \$39.95

Requires: 64K RAM, one disk drive, DOS.



Diagnostics (continued)

cheaply printed and hard on the eyes. Before running the disk drive tests, you're prompted to use a head-cleaning disk, even if you don't want to. Other than

for a head improperly angled over a track, and a continuous read/write test for checking out new or recently repaired drives.

Interrogator is the disk analyzer to have if you'll be doing

tion as an analyzer, although that's not its role in life. Central Point Software's *Copy II* PC program, meant for backing up your copy-protected disks, includes a drive-speed utility. If

what they claimed, all five were run on a PC that was in perfect shape except for one drive slipping out of alignment. All but one program spotted the problem, but none agreed on the se-

FLOPPY DISK TESTS

Program	Disk speed	Alignment	Read/Write		Cross-talk	Backlash	Hard disk	RAM	CPU	Monitor	Keyboard	Printer	Price
			Clamping	Noise									
Datalife Disk													
Drive Analyzer	P/OK/F	P/OK/F	P/OK/F	P/F									\$ 39.85
RID	P/F	P/F	P/F	P/F	P/F	P/F	P/F						\$ 34.95
Interrogator	Exact	Exact	Exact	Exact									\$139.00
Diagnostics II				Exact									\$125.00
Cross-Chex	Exact	P/F	P/F	P/F		P/F		Yes	Yes	Yes	Yes	Yes	\$ 99.00
Copy II PC	Exact							Yes	Yes		Yes	Yes	\$ 39.95

Note: Programs report floppy disk results as pass/fail [P/F], pass/acceptable/fail [P/OK/F], or give exact readings [Exact].

OTHER TESTS

The chart above shows testing capabilities of various diagnostics programs mentioned in this article.

that, the program runs nicely. The hard disk test doesn't affect data on the disk.

Technical Trivia

The 50-page *Diagnostics II* manual is awash in technical trivia, partly because it's possible for a user to set test parameters in hexadecimal. The *Diagnostics II* floppy drive test is meager and fails to give a clear on-screen warning that the disk read/write test destroys any data in the drive being tested. Its memory and printer tests are fairly sophisticated, though one version of the memory test takes 13 hours to test 16K of RAM. Fortunately, there's a quick, one-minute version, too. The hard disk test overwrites data on the disk.

Diagnostics II is the only disk that can be duplicated. The others have specially created, out-of-alignment tracks to test alignment, clamping, and backlash. Even if you could make a copy that ran, the results wouldn't be valid.

Dysan's *Interrogator* (\$139), which tests floppy drives only, is a gem. All readouts are in exact numbers. The illustrated manual is technical but clear if you read through it twice, and the overall package has the solid, silky feel often associated with expensive, well-machined products from Germany. It has one test the others lack—azimuth alignment—to check

service work, although *Diagnostics II* can also be used. However, *Interrogator* is probably overkill for most people. You just don't need the level of sophistication Dysan offers.

One other program can func-

tion as an analyzer, though that's not its role in life. Central Point Software's *Copy II* PC program, meant for backing up your copy-protected disks, includes a drive-speed utility. If

to see if the programs did

what they claimed, all five were run on a PC that was in perfect shape except for one drive slipping out of alignment. All but one program spotted the problem, but none agreed on the se-

To Err Is Human

Software companies have such similar names that you can't tell the players without a scorecard. Take the case of Human Engineered Software and Human Edge Software, two Silicon Valley companies with the same initials (HES) and even the same first and last names.

Despite this similarity, the two companies make quite different software. In Brisbane, California, Human Engineered Software, best known by its HES initials, has been a leading maker of software for Commodore's home computers. From its Palo Alto headquarters, Human Edge Software, however, has aimed its line of expert-system software (including *Sales Edge* and *Communication Edge*) mainly at the IBM PC and Apple markets.

Confusion came to a head this fall when troubled Human Engineered Software filed for Chapter 11 protection and was acquired soon afterwards by Avant-Garde of Eugene, Oregon. At the same time, Human Edge Software was having a successful first year of sales and was in the midst of a round of financing for further growth.

Now, to its horror, Human Edge Software learned just how much the computing public was confused by these similar names. Friends and reporters called up to ask if they were going bankrupt and some retailers refused to speak to Human Edge's sales people, not wanting to deal with an unreliable, bankrupt manufacturer.

The worst case was a classic public relations nightmare. In a television appearance by Human Edge's president, James Johnson, an analyst from Dataquest started grilling him about his company's supposed bankruptcy...on the air! If industry experts can't keep these names straight, who can?

—James Langdell

Buyer's Guide

Which one should you buy? Dymek's *RID* has the most tests for the fewest bucks. The Verbatim tester is fun to watch running and has that third, marginal-pass parameter. If you're into technical excess and have the money, go with the Dysan *Interrogator*.

If you want more tests than just the ones for floppies, *Cross-Chex* has the most useful hard disk test and its manual has less techno-babble than the *Diagnostics II* manual does. Both can spot bad RAM chips, among their other uses.

If one of the diagnostic programs does find a floppy drive problem, transfer the suspect data before making repairs. On a two-drive PC, read from the sick drive and write a copy to the healthier drive. ■

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External 10 Meg \$944

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Using the same amount of power as a floppy drive, the Qubie' hard disk uses less energy than other aftermarket drives.



The drives come complete with 1dir software. 1dir's commands are in English, eliminating the need to

type in DOS commands, and are all selected by using cursor control keys. 1dir even explains commands with HELP screens that give you on-line advice when you need it.

Qubie' drives are made of special plated recording media. They withstand the vibration and movement that has damaged hard disks in the past. In fact, Qubie' drives have been selected by several computer makers for use in their portable computers.

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PRODUCT REVIEW

Personnel Improvement?

A management training disk misses a rung on the ladder to success.

BY RICHARD POWELL

People Management

CBS Software
1 Fawcett Pl.
Greenwich, CT 06830
(203) 622-2525

List Price: \$79.95

Requires: 128K RAM, one disk drive.

CBS Software's Managing For Success series is a computer-assisted management training series designed to help you understand what makes an effective manager and assist you in developing your own potential as a manager. It is geared toward helping you manage more effectively, whether you work in a for-profit, nonprofit, or volunteer organization. The questionnaires used in this series were developed over 10 years by the Institute For Management Improvement and administered in small- and middle-size businesses as well as in Fortune 500 companies.

People Management, a new entry in the series, is composed of four disks, each containing one topic or unit. Each unit has

its own sub-units, which make up a Thoughttree. This is nothing more than an annoying way of graphically displaying what is essentially just a menu.

The first *People Management* disk is devoted to Leadership and its 3 sub-units: What is Leadership?, Understanding Influence and Authority, and Using Leadership Strategies. The other disks' topics are Team Building, Motivation, and Communication. The Program Guide provides you with operating instructions, worksheets, and references for further study.

Each unit and sub-unit pre-

sents common management problem situations. They create a scenario, offer a small amount of background information, and ask you to choose a solution from the options on the screen. If you pick the right one, the program congratulates you and tells you why it was correct. If you are wrong, it tells you why and asks you to go back and try again. Confronting the situations on each disk is supposed to teach you about effective personnel management and sharpen whatever skills you already have.

Sound impressive? Not for

long. The program gives you so little background information that instead of making a rational decision, you find yourself engaged in a guessing game with your computer. Worse, *People Management* has been programmed so poorly that it takes an exorbitant amount of time to run.

Scenarios show up on the screen line-by-line instead of as an entire page. When you make an incorrect choice and are asked to go back and make another, you are given the same three options without any indication of what your original incorrect choice was. Because it takes so long to run through the process, you may have already forgotten what it was.

As your frustration mounts, the natural inclination is to try to speed things up. Don't bother. With programming right out of Bob and Ray's Incredibly Slow-Talking Man routine, even the message, "press spacebar to continue" only works when the red light goes off, up to 3 seconds after the message appears on your screen.

You can wind up spending 2 hours running the program for just a few minutes' worth of management training. This eliminates any possible benefit of computerizing the instruction of a subject such as this. If you want to learn about people management, go out and buy a good book. ■

How to Make Your Own PC News

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Please send your stories and tips to PC News, *PC Magazine*, One Park Ave., New York, NY 10016, or through your computer to Source BBB343 or MCI Mail 157-9301.

Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
February 16-20	The International Software Update II	Discussions of international domestic software standards, marketing strategies, and more.	The Waiohai Resort Kauai, HI	The International Microcomputer Industries Association 21 Tamal Vista Blvd., #175 Corte Madera, CA 94925 (800) 732-2300 (415) 924-1194 (in CA)
February 20-25	INFO/CENTRAL	Sessions on telecommunications planning and software for data security.	O'Hare Exposition Center Chicago, IL	Banner & Greif, Ltd. 110 E. 42 St. New York, NY 10017 (212) 687-7730
March 4-7	Interface '85	System and services for large-scale corporate, government, and institutional users.	Georgia World Congress Atlanta, GA	The Interface Group 300 First Ave. Needham, MA 02194 (617) 449-6600

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People in the News: Dan Bricklin

VisiCalc's creator has emerged from his legal battles with high hopes for the future.

BY VIRGINIA DUDEK

WELLESLEY, Mass.—“We started this whole thing,” says Dan Bricklin, speaking about the use of personal computers in business. “I never used to say that till other people said it,” he adds by way of apology, “but our industry may not have been where it is if we had not done the electronic spreadsheet.”

A man given to few pretenses, Bricklin's office attire consists primarily of jeans and a plaid shirt. But, perhaps, a prizefighter's robe would be more appropriate. In the past year, he has seen his program, *VisiCalc*, dethroned as the business software champion on the best-seller lists. And, he has just emerged from a lengthy, bitter court battle with VisiCorp, the corporation that was once his strongest ally in the industry.

Bricklin is the chairman of Software Arts, Incorporated. In 1979, he and cofounder Bob Frankston created *VisiCalc*, the first electronic spreadsheet program, and are acknowledged as being principals in that early cadre of individuals who spurred the fledgling personal computer industry and ran smack up against the hard realities of business life in a multimillion-dollar industry.

Hindsight

Bricklin and Frankston initially contracted with Personal Software to publish and distribute *VisiCalc*. Then, *VisiCalc*'s sales became so impressive and its reputation grew so wide that Personal Software's name evolved into VisiCorp, with most of its products' names beginning with “Visi.”

“They had other products after *VisiCalc*,” says Bricklin, “but they didn't name the company after those; they renamed their products Visi this and Visi that. So, it was obviously very important to them.”

Business disputes between

the two corporations eventually led to lawsuits and countersuits. The companies duked it out for 9 months until they finally settled out of court last fall, with Software Arts regaining the rights to *VisiCalc*. Bricklin still shows an edge of resentment



when he talks of VisiCorp and the way he believes the company treated him and Frankston.

He says VisiCorp presented a public image of them that seemed to be aimed at keeping the two men in the broom closet instead of in the limelight. “People got the image that Software Arts was just Bob and me in an attic, sitting around collecting royalty checks, which was not true. Because they (VisiCorp) were helping that image, we lost something that would be of any value to our company.”

On reflection, Bricklin thinks he's been able to identify some of the pitfalls that led to the problems between his company and VisiCorp. “If you have two companies that are very dependent on each other, you should see about getting closer together. Communication is a large portion of it,” he says.

“People are trying to generalize a lot of things from the lawsuit that maybe are not appropriate,” comments Bricklin on the tug-of-war between

VisiCorp and Software Arts. He sees the dispute as a conflict between developer Software Arts, whose products he says were responsible for 60 percent of VisiCorp's revenue, and VisiCorp, which wanted to market only “hit” products, but never actually found another product as successful as *VisiCalc*.

In the days before the lawsuits, Bricklin recalls dealing with VisiCorp over distribution of *VisiCalc* monies. “Most of the other VisiCorp authors were bought out by VisiCorp,” he says. “I thought we almost had a deal once. But, the negotiators had no bargaining power, and the board would shoot down the proposals. It was a lot of money for them to pay. So, we said we'd buy them out, but they didn't want that. In fact, they sued us a few days after we proposed it.”

The legal proceedings came to an end 9 months later, but, in the meantime, Software Arts had seen its product drop from the top of the best-seller list and had only moderate success with its release of two new products, *TK/Solver*, an equation processor for personal computers, and *Spotlight*, a desktop manager.

Not Worried

However, Bricklin isn't worried by the Lotuses and Microsofts of the world. “We were the first spreadsheet, period,” he says. “We lasted a pretty long time, considering everyone and their brother went after us. Even in '82, we sold over 200,000 copies of *VisiCalc*, officially more than Lotus sold. In '83, we were still number one, and there was very little advertising for *VisiCalc* that wasn't tied to *VisiOn*. In 1984, there was almost no advertising for *VisiCalc* except what we did, which made it difficult to stay in the top position. You would expect

a product with a lot of competition to have problems.

“In a given category, one company frequently dominates for a long time, until something happens that will change it. It's often a new piece of hardware that causes things to change. Lotus never knocked us out with the Apple (*VisiCalc* was originally designed for the Apple). We had a great piece of code on the Apple. Our competitors tell us we would still be number one on that machine. On Atari we do OK. Basically, we still do OK on those machines that we're good on.”

Bricklin's optimism is unbounded. “In terms of coming back, there are many times in the future we will come back. I'm not worried about that. In certain areas, Lotus is just as vulnerable. It's just that with the machine they're on they have a very good cash cow. *VisiCalc* looked invulnerable, because it had all those different products, but it went down real fast.”

Bricklin and Software Arts have not hesitated to move on with new products, but the lawsuit has carried over some name identification problems. “People think I'm the chairman of VisiCorp,” he says. “More likely, they think everybody works for a company called *VisiCalc*. People think when they're dealing with VisiCorp they're dealing with us, which costs us money in not knowing about new opportunities.”

Bricklin knows the identity of his company and his products and does not hesitate to spell out where he sees himself. “We do innovative products,” he says. “And we stay with them. We have a lot to contribute, probably more than most other companies in the industry. Were we not around, I think the industry would be worse off. There are not that many other companies you can say that about.” ■

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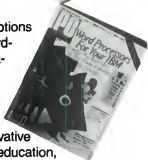
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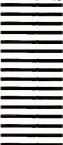
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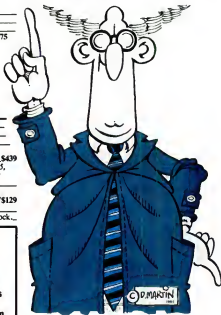
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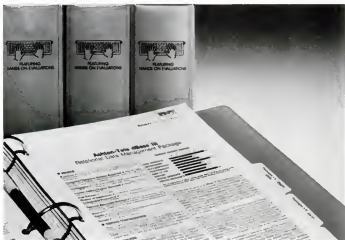
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Manual Labor?

Everyone hates manuals, but most users accept them as a necessary evil. Truly well-designed software could eliminate them by adapting itself to users' needs and preferences.

Apple has recently been fouling the airwaves with a cheap-shot TV commercial for one of its toy computers suggesting that no user can even turn on an IBM PC before slogging through three foreboding manuals. As the camera pans past a PC, a half-foot of IBM documentation thuds undecorously into view from above; when the Mac slides by, a frail booklet floats gently down to the surface like an autumn leaf.

Only the most lumpen chowderheads will be taken in by this deceit. Two-thirds of the IBM tomes in the ad are its DOS and BASIC reference manuals. To imply that the PC will remain a useless hunk of glass-epoxy and stamped steel unless the user masters EDLIN, DEBUG, and the hex scan codes for the left and right brackets is like saying that a vacationing foreigner doesn't have a prayer ordering a Big Mac unless he's memorized all 2,662 pages of *Webster's Third International Dictionary*. What the Mac's skimpy operating manual *does* connote is skimpy computing ability.

But this Cupertino con job does expose a nerve. Nobody likes manuals. Fact is, every intelligent user loathes them. And with the proper software, there's no need for them. When you lay down a few hundred bucks for the very latest turn in productivity, you want to start producing right away. You want to

stick in the disk and go. What you don't want is to struggle through hours of maddeningly turgid prose before you can do even the most primitive operation.

The software itself should help, but



Paul Somerson

there is virtually no software standardization today, and what little exists is nonintuitive. Software manufacturers regularly churn out armloads of products with utter disregard for both intuitive ease of use and preservation of the few existing standards that make sense. Best sellers create de facto standards, but not always logical ones, and these are rarely embraced by spiteful competitors. Standardization would make it too easy for users to test drive new software, and no manufacturer wants its custom-

ers to see how much better the other guys' packages are.

Since standardization is a pipe dream, the next-best step would be to offer genuine intelligence and ultracustomization. Software can be very capable and fast but is generally inflexible and stupid. Such programs make you learn someone else's commands instead of letting you use your own. They force you to do work they should, been clever enough to handle. And they are utterly passive.

Software should install itself. You should be able to rip open the package, put the raw disk in your computer, and have it direct its own configuration, asking you only the few questions it can't figure out by polling the hardware. This is easy. Virtually no software vendor does it. Instead, the packages make you hunt down a chapter and follow a snarl of instructions geared for all kinds of oddly configured systems.

Once installed, programs should offer users the option of selecting their own command language. The software should list the important commands and defaults, then allow users to customize them. There also should be a simple option of installing—with one keystroke—whole slates of commands that mimic those of the most popular packages. No set of commands in one program will cover those of another program

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EDITOR'S SCREEN

exactly, and the software would list these missing commands and offer defaults or user customization. You should be able to toggle between the user-customized

commands and the defaults, so that a secretary or boss would not go bananas when checking or amending data on a worker's system.

Smarter Software

What would be a bit trickier—but hardly impossible—would be to give the software some real intelligence. It's not hard to make programs smart; it just means more code. It also means a potential temporary slowdown in program operation. But beginners are more interested in mastering the commands than in working at breakneck speed. Once the commands are down pat, the dilatory code can be done away with either by the program or the user.

Menu-driven software is not the answer. No one wants to plod through ten screens to get to a command accessible only on the eleventh. Macros are only a stopgap solution, since they save steps but don't offer any intelligence or guidance the user doesn't already have. A program should be sophisticated enough to notice that nine times out of ten the user starts a program with the same 20 keystrokes. The eleventh time it should offer to execute those routine keystrokes automatically and jump to the appropriate place in the program where real work begins. Or, it should monitor keystrokes, and when it notices, for example, that the user has moved the cursor only a letter at a time, flash a message mentioning the commands for moving it a word or a sentence at a time.

Obviously such intelligence would have to be implemented with great care to prevent it from becoming obtrusive and also would have to remove itself from the foreground as the user became more advanced. It would, however, notice if a new user suddenly started playing with it ("Dave . . . what are you doing, Dave . . .").

Software is beginning to saturate the cream of the market—the users with enough intelligence, curiosity, and patience to struggle up the learning curve. To reach a far wider audience, it will have to become a whole lot smarter and easier—and come down to the level of the user, instead of making the user come up to its level. ■

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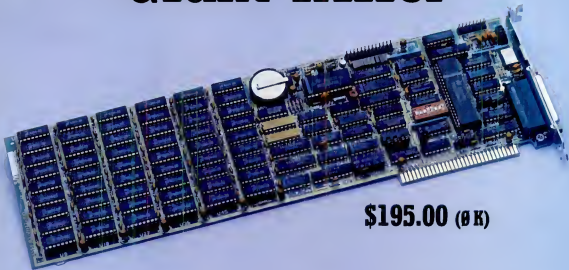


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Long Live the Almighty Manual

On-line technology has made wonderful advances, such as tutorials and help screens, to aid software users, but nothing has yet been produced that renders the manual completely useless.

A fond dream of all software vendors and many users is to get rid of printed reference manuals and put documentation on-line.

Well, it isn't going to happen. While on-line documentation may be better than print in some cases, a good manual wins out in the long run.

All software documentation has three important tasks: to help a new user get up and running, to provide an overview of the product, and to give detailed instructions on how to use the product. Of course, all documentation tools can handle these tasks, but each handles some better than others.

Now, it is possible to create special software to handle the installation, and it will be necessary to eventually do so for computers to reach a truly mass market. But, for the moment, I believe that the printed manual is the only type of documentation to satisfy the first task because it is simply easier and cheaper to stick with printed instructions and a modest initial configuration program.

The introduction and initial chapters of a printed manual can very nicely describe software features—which constitutes documentation's second task—but unfortunately, not everyone reads them. New users play with the software until they think they understand it and then reach for the manual when they have

questions. The manual becomes their security blanket.

A help screen can graphically show the system and its parts with text, but if you don't specifically ask for it, the infor-



Joseph Rigo

mation is never displayed.

On-line tutorials excel at introducing software because they lead you through the entire package and let you perform a few simple functions under their control. They may hold a new user's attention for about an hour. Few people spend that much time with the introduction to a manual. However, no one runs a tutorial more than once because it is boring, time consuming, and often frustrating. Therefore, although tutorials effectively introduce software, they fail at documenta-

tion's third task—continuing education and reference. Help screens and manuals may also frustrate you, but at least they do it faster.

Help screens excel for simple answers and one-screen charts but are not very effective for teaching new functions requiring several pages of material. For example, I would not want to have to learn 1-2-3 from help screens. I like to key my entries, run a test, and then stare at the screen and the manual for more or less the same amount of time to figure out why nothing works.

Help screens also have technical limitations. First, documentation text and graphics eat up disk space and memory. Processing also suffers; even mainframe systems slow down when trying to handle extensive documentation files.

I believe the printed reference manual handles the overall documentation job better than any of the on-line alternatives devised so far. Conditions may change. And technology may eventually allow future generations to feel so comfortable with on-line information that they will give up their printed manuals, but don't count on it. Print has a way of hanging in there. ■

Joseph Rigo began writing technical manuals for IBM in 1964. He is currently president of Sysdoc, Inc., in New York.



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Letters to PC

Which Came First?

Either John Helliwell hasn't seen the Data General One portable or Bill Machrone and Charles Bermant haven't seen the STM portable because each seems to think that the machine they reviewed for the same issue was the first with a 25x80 liquid crystal display (LCD) screen.

Machrone and Bermant write in their PC News story that "the DG/One's screen is the first commercial offering of a 25x80 LCD" ("Data General Portable Sports Desktop Features," PC, Volume 3 Number 21, page 33). In "STM Brings Desktop Power to a Portable—Almost," Helliwell writes that the STM has "the first LCD screen on the market with a full 25 lines by 80 characters."

Can you clear this up for us and tell us which one really came first—STM portable or the DG/One.

Benjamin Vernia
Ann Arbor, Michigan

The DG One has the first 25x80 LCD that retains the standard CRT form factor.—Ed.



AT Keyboard's Shortcomings

Your enthusiasm for the "unassailable" IBM PC AT keyboard overlooks a major defect that it was unlucky enough to inherit from the PC keyboard ("IBM Brings Out the Big Guns," PC, Volume 3 Number 22.) Once again, there is no

second Ctrl key on the right-hand side for the convenience of touch typists.

Alan Wachtel
Milpitas, California

Linear Regression Additions

I found Dr. Jeanty's article "Performing Linear Regressions with 1-2-3" very informative (PC, Volume 3 Number 20).

I did find an error on page 247. The formula entered in cell F13 should be

$$+F8-F4*F5/F3$$

instead of

$$+F8=F4*F5/F3$$

Also, I was only able to reproduce the graph in Figure 4 (page 248) by substituting the following formula in cell D3:

$$+C3-1.98*(@SQRT((1/(\$F\$3-2)) * (\$F\$12-($F\$132/(\$F\$11))))$$

In cell E3 I had to substitute the following:

$$+C3+1.98*(@SQRT((1/(\$F\$3-2)) * (\$F\$12-($F\$132/(\$F\$11))))$$

I would love to see a future article on multiple regression analysis using Lotus's 1-2-3.

Kenneth Atwater
Broadview, Illinois

P. Jeanty replies:

The first mistake Atwater noted was a typographical error. The second formula that he points out is an alternative method for computing the standard deviation and is perfectly valid. The formula I used (which is correct except that the last \$F\$10 should be \$F\$11) is shown in Statistics in Medicine by Theodore Colton (Little, Brown, 1975), on page 201. I

introduced Atwater's formula in my original worksheet and it provided the very same line.

I was also interested in multiple regression analysis using Lotus's 1-2-3. A friend and I tried to develop a worksheet but it became a problem because matrix and vector arithmetic are difficult to handle with Lotus's 1-2-3. There is a package called Pairstat from Davell Custom Software, of Cleveland, Tennessee, that can be used for polynomial regressions.

In just a few hours, Dr. Jeanty's article on linear regressions taught me more about using Lotus's 1-2-3 than reading the program's manual over a series of days. Plus, I got the extra bonus of learning about a valuable tool that I'll be able to use in my daily work.

P. Koeppe
Berlin, Germany

Dr. Jeanty's article "Performing Linear Regressions with 1-2-3" beautifully demonstrated how the careful planning of spreadsheet layout and imaginative use of the full range of 1-2-3's features can produce a powerful program with a wide range of applications.

The instructions were easy to follow, and the explanations of the formulas helped me to understand the correct application of the functions of Lotus's 1-2-3—particularly its graphics capabilities.

To make the matrix easier for people who want to use these equations frequently, just save the first page of the worksheet (the screen that appears when you press the Home key) and include your notes and general instructions. This will save time when you want to use the equations again.

Jack Whitehorn
Albuquerque, New Mexico

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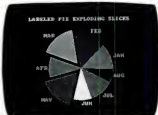
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LETTERS TO PC

SAT Help On-Disk

I found Mark Malamud's review of the *OWLCAT 60-Hour SAT* course very beneficial ("New Help in the SAT Grind: Study-on-a-disk," *PC*, Volume 3 Number 18). I would like to read a comprehensive review of other SAT-related programs, especially ones that discuss cost/benefit analysis or have some data showing effectiveness. This would be an interesting project that would be of great value to the educational community.

Patrick Sweeney, Ph.D.
Atlanta, Georgia

Mark Malamud replies:

I am not aware of any comprehensive reviews of SAT software. However, PC Magazine is planning to run a broad cost/benefit analysis of several on-disk study-aid programs. Look for it in an upcoming issue. In the meantime, several companies have SAT-related packages, including Krell Software, HJB Software, CBS Software, and Barron's, all in New York, and Intellectual Software in Connecticut.

Network Speed Race

In a PC News story on IBM's PC Network, Bill Machrone writes, "3Com's EtherSeries is the current PC speed champ, with a 10-megabit data rate" ("IBM Switches to Sytek's Broadband for PC Network," *PC*, Volume 3 Number 20, page 35). The implication is that PC Network is slower than EtherSeries because its channel data rate is only 2 megabits per second.

Our experience with PC-based LANs shows that channel data rate has little to do with overall performance. It is the networking software that makes the greatest difference.

Our benchmarks indicate that 3Com's EtherShare is a poor performer in spite of its channel rate. Orchid's PCnet is a better performer for our applications even though its channel data rate is only 1 mbps. Novell's NetWare is an example of networking software that has what we

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Bill Jacobson
*From a feature article in
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LETTERS TO PC

call "the right stuff." It significantly outperforms 3Com's, Orchid's, and most other Network Software.

I expect that IBM's PC Network also has the right networking software and will take advantage of the on-board 80186 processor and memory. The broadband nature of the network implies that IBM has other things in mind for PC Network in the future.

Ed Sawicki
Beaverton, Oregon

Solar Energy Software

I really enjoy *PC Magazine*, and I look forward to every issue. Your articles have brought me a long way. "Project: Database" was especially helpful (*PC*, Volume 3 Numbers 11-17).

I am presently looking for a solar energy home design program. Can you help me find one?

Robert E. Potter
Richland, Washington

We suggest that you contact the Berkeley Solar Group for information on solar software programs. Their address is 3140 Grove St., Berkeley, CA 94703, (415) 843-7600.—Ed.

Pleased with the Gemini 10X

I found your comparative review of printers very useful. However, as a satisfied user of the Star Gemini 10X printer, I take strong exception to M. David Stone's totally negative review of my favorite printer ("Dot Matrix Printers: Character Building," *PC*, Volume 3 Number 23, page 145).

After a year and a half of using my Gemini 10X daily, the only substantial complaint I have is that the ribbon does indeed occasionally slip off the guide. I have found that the thickness of the ribbon is the main problem. If a situation comes up in which you have to replace the ribbon with one that is thicker than the original, you might run into problems. If you pay attention while threading the ribbon during installation and

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LETTERS TO PC

check the ribbon tension daily, you will be likely to eliminate the problem, or at least keep problems to a minimum.

Stone must have received at least a year-old version of the user's manual. When I purchased my Gemini 10X, it came with a cheap, hard-to-read manual. Shortly afterward, I received a new, typeset, and beautifully illustrated, 282-page manual with a colorful cover. I have found that the manual clearly illustrates all of the printer's features including paper loading, ribbon changing, and correctly selecting alternate print patches and graphic uses. I use the manual often and have found it easy to use and very helpful.

Stone claims that the Gemini 10X produces poor print quality. I disagree. I use the normal single-pass 10-pitch for my work, and I've never received any complaints about its quality. In fact, people have even asked me which printer I use and how it produces such clear print.

Maybe Stone did have a bad experience with his Gemini 10X, but I feel that his review does a disservice to a capable, well-made printer.

Adam F. Carr
Memphis, Tennessee

M. David Stone replies:

I stick to my original impressions of the Gemini 10X. The ribbon that I had difficulty with was the ribbon that came with the printer. Also, the manual that I used with the printer was the one that Star Micronics sent to me. I can only review what I see.

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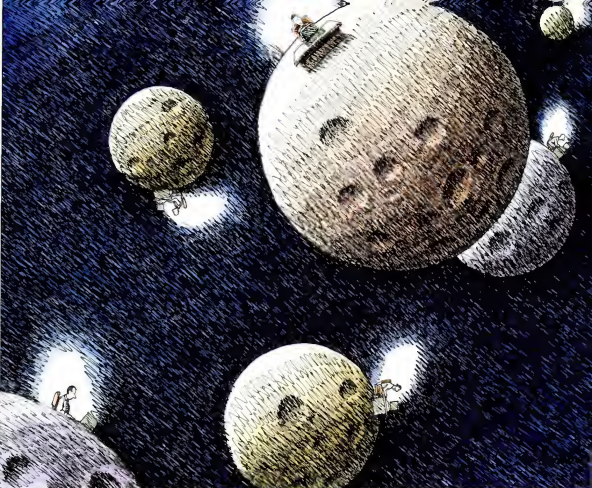
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Two "screen drivers," along with the ANSI device driver, solve the problem of writing information on the computer's display screen—one that writes direct to memory and one that uses BIOS.

The practical problems and issues involved in trying to write programs that will work on the entire PC family, present and future, (and also on as many other computers as possible) are important to everyone. They are compounded by the requirements that the programs run under all versions of DOS, present and future, as well as with windowing systems such as *TopView*.

Developers don't want to rewrite their programs for every new machine or DOS that comes along. And everyone who uses PCs wants the programs we use to move easily into the future, working without any problems on new products like the PC AT and DOS 3.1.

The issue boils down to the problem of writing information on the computer's display screen. Basically, everything else that our programs do can be done easily and efficiently with standard DOS services; so it's practical to write DOS-generic programs, programs that will work on any version of DOS and any computer that uses DOS. But when it comes to full-screen output (writing information at liberty anywhere on the display screen), DOS lets us down.

The Crux of the Matter

I've talked about this problem in a theoretical way in the past, but recently I've had to face it when I rewrote the software

I sell. From that process, I learned some tips and tricks of how to do screen output well. As a software developer, I could treat what I've learned as trade secrets, as many do. Frankly, though, we'll all be



Peter Norton

better off the more we write our software in a way that does not limit how widely it can be used.

As I discussed in the last issue, the practical solution I found was to create three different "screen drivers," three sets of subroutines that do the work of placing information on the computer's display screen. The working parts of the program fire the information they need displayed to a master video handler, which then in turn routes the request to whichever of the three drivers

happens to be active at the time.

These drivers have varying degrees of speed and "breadth." The fastest is the narrowest—it writes information directly to the IBM display screen memory, and so it works only on computers that exactly mimic the PC and its two original display adapters (more on this later—hot news). The middling driver uses the official IBM PC BIOS services; so it's less of a performer than the first driver, but it's usable under broader circumstances than you might think. The crummiest driver uses the DOS facility known as the ANSI device driver (covered in the last issue). This driver is slow, but it's supposed to work on any DOS computer, no matter how incompatible it may be with the IBM PC—true in theory and mostly true in practice.

What's the point of two different IBM-specific drivers—the direct-to-memory driver and the use-the-IBM-BIOS driver? You might think that each is so IBM-specific that there's no point in having both. But that's not true. The second driver, the one that uses IBM BIOS service calls, actually works in a number of non-IBM circumstances. You see, many personal computers don't exactly match the PC on a hardware level but show a high degree of IBM compatibility by mimicking the IBM BIOS calls. That's compatibility on a software level, as op-

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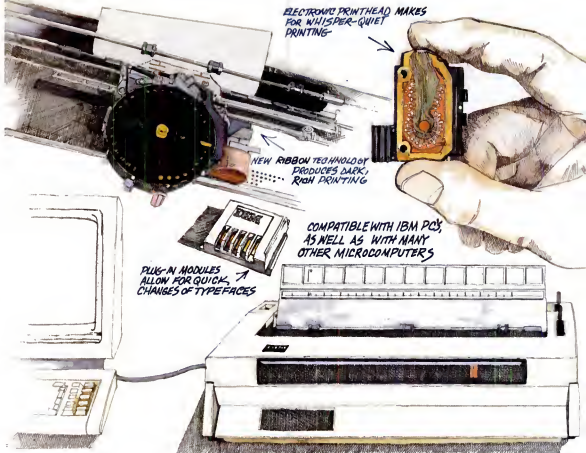
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Entering numeric data into your PC is a very serious, very tedious business. Since a lot of this work is done by your fingers, doesn't it make sense to use a numeric keypad that was designed for the human hand?

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The Touchstone 2 puts 53 key commands under the complete control of one hand. All of the most frequently used keys are accessible with a single touch, while a local shift key provides handy access to PgUp/PgDn, Tab Left/Right, ten standard F-keys, and other special control keys that you may need on an occasional basis.

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All your favorite keys in one place

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ctrl, prt sc, and more; plus all ten standard function keys.

Even a place for your macros

To keep it compact, we couldn't include the whole alphabet, but Touchstone 2 does have A, B, and C to use as handy and easily-remembered hooks for user-defined keyboard macros.

Enter numbers twice as fast

Touchstone 2 data entry takes about 40% of the hand movement usually required with the standard PC keyboard. Even more important, it eliminates the need to look for each digit as it is entered.

Superior ergonomics

Low-profile design meets DIN specs; reduces fatigue. Number pad has side-mounted Enter and math keys that conform to the traditional calculator layout. Heavy-duty case is easily lap-portable, but won't slide around. Standard locating pip on 5 key helps keep fingers where they belong.

Reliable performance

The Touchstone 2 has its own unique microprocessor with 16-character buffer and patented Entry Error Elimination system. Next-key rollover feature ensures positive entry of every keystroke, even when a previous key has not been fully released.

Full-travel keyswitches are rated for 50 million cycles; provide quiet yet positive feedback. Contacts are covered by a protective membrane to guard against dirt, dust and accidental spills.

Touchstone 2: Built so well it carries a full one-year warranty and a 15-day unconditional guarantee.

A plug-in workmate for the IBM PC and many compatibles

Split cable and standard connectors allow you to use the Touchstone 2 alone or side-by-side with the main keyboard of your IBM PC or XT and many compatibles. Additional models available soon will be compatible with the IBM PC-AT, PC JR., and Compaq.

An investment in greater efficiency

The all-new Touchstone 2 takes the tedium out of number-crunching; lets you concentrate on more challenging work. The time you'll save will quickly return your small investment of \$199.95. Order by mail or phone for immediate shipment, or ask for it at leading computer and software stores.

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CIRCLE 507 ON READER SERVICE CARD

posed to a hardware level, and many personal computers that aren't hard-core PC-compatibles do manage to be compatible on this level.

Getting our software to run on those BIOS-compatible computers is one important reason for having a screen driver that uses the BIOS services exclusively, but there's another important reason. We're starting to see new operating system environments and windowing systems, such as IBM's *TopView* and Digital Research's *Concurrent PC-DOS*, that work much better with programs that don't write straight to the screen but do use the BIOS services. It's relatively easy for them to intercept screen output that's routed through the BIOS. And once they do intercept the output, they can fit it neatly into the overall scheme of what's going on in the computer and its windows.

A final element makes using the BIOS services for screen output very attractive: our programs then have a much better guarantee that they will work fine on any new PCs and especially on any new display adapters, such as the Enhanced Graphics Adapter and the Professional Graphics Controller.

You might think the only way to go is simply to use only the IBM BIOS services and not bother with any other kind of screen driver. But there are good reasons for having the other two drivers as well. The ANSI driver extends our software to many thoroughly non-PC-compatible machines, which is worthwhile, although frankly, servicing non-PC-compatible machines is becoming less and less important as the PC rules the roost more and more.

Memory Driver

But what's the benefit of having a driver that writes straight to the screen memory? And then too, isn't there a risk of incompatibility with the PC as IBM brings out new display adapters that don't use the original PC-adaptor display memory?

The main advantage of straight-to-the-screen memory output is simply that it works much faster than indirect methods. An efficient program's screen output appears much more briskly when the program writes that output directly into the display memory than if it is routed through the BIOS services. The differ-

The main advantage of straight-to-the-screen memory output is simply that it works much faster than indirect methods.

ence in performance is noticeable even when there's only a moderate amount of screen output and even on the PC AT (which you'd think was fast enough to make BIOS screen output seem instantaneous). If you're not running on an AT or if you're writing a full screen-load of information, the difference in performance is more than just noticeable—it's enough to make an entirely different impression on the user as to how hot a performer the software is.

Using direct memory output has another advantage besides speed: instantaneous presentation. No matter how long it takes our programs to create all the information we're showing on the display screen, the direct-to-memory technique makes it possible for it all to appear at once.

The technique is simple, and many good programs use it: as the screen information is created field by field, our programs can place it into a working copy of the display memory (located somewhere else in memory), instead of placing each field into the display memory. Once all the output information has been generated, the working copy can be moved into

the display screen's actual memory area with a single, very fast, assembly language instruction. The screen image appears truly instantaneously; this effect is very impressive. The oldest and newest versions of my utility programs (Versions 1.00 and 3.00) use this method. The impression they make on the user is far superior to my other versions, even though the working result turns out to be the same.

Addressing the Risks

Writing information straight to the screen memory seems like a risky proposition, though, because to do it we have to lock our programs into the well-known memory addresses the display adapter uses: hex B000 for the monochrome display adapter and B800 for the color graphics adapter. But other display adapters don't necessarily use these addresses, and IBM has long warned us against using them.

However, so many important programs use these addresses that IBM has taken the trouble either to use them or to simulate them in each new display adapter it has introduced. This holds as true for the PCjr as it is for the new Enhanced Graphics and Professional Graphics adapters.

Fortunately, IBM has not only decided for the moment to support these memory addresses for their recent work, it has officially stated that all future adapters will support the same addresses for the standard display modes. This little-known good news is actually important to software developers as well as users. It means that we can count on using these addresses and the advantages they bring for the entire life of the PC family of computers. And that's very good news to us all.

Stay tuned for the next issue's column. We'll look at some of the pragmatic, technical details involved in using both the BIOS and the memory driver. We'll also go over a few tips on *TopView* compatibility. ■

Don't buy a spreadsheet

A lot of electronic spreadsheets just can't cover your needs. They don't go far enough.

They're unable to work like you or adapt to the way you think.

Time for Microsoft® Multiplan®, the high energy spread. A spreadsheet with more workspace than the other leading spread. Full of high performance capabilities for your IBM® PC, PC XT, PC jr. or other MS™-DOS microcomputer.



Multiplan loves you as you are.

Other spreadsheets force you to learn how they think. Multiplan learns how you think. It remembers the way you work. Anticipates frequent commands. Even offers suggestions on spreadsheet set-up.

Commands are in English. So are formulas. Instead of typing mysterious coordinates like H54-L73=BK154, you can simply name worksheet areas: Sales - Costs = Profit.

that spreads too thin.

Multiplan can link information in different spreadsheets. When you make a change on one, every related one is changed.

Multiplan has optional Multiplan Application Programs that work with you to design and build custom spreadsheets for Budget Analysis, Financial Statement Analysis or Cash Planning in minutes. Not hours. Or days.

The trained mouse.

Multiplan has an optional Mouse. A handy little critter that flies through Multiplan so easily you barely have to lift a finger to select and execute commands. Small wonder Microsoft gets more performance out of a spreadsheet. We designed **MICROSOFT** the MS-DOS operating system that tells the IBM PC how to think. And our BASIC is the language spoken by nine out of ten microcomputers worldwide.

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SPOTLIGHT.TM MANAGER THAT

The SpotlightTM program offers a combination of online desktop accessories unmatched by any other organizer. Six accessories, all with exclusive capabilities, make Spotlight the single most effective business tool that businesspeople can use to organize their workday.

Better yet, Spotlight takes only 10 minutes to learn. Just a keystroke suspends your application program, giving you a window into Spotlight. Another keystroke brings you back to where you were just as quickly. It's that easy.

Spotlight a window to your workday.

Spotlight's full-color, easy-to-read windows organize all your business tasks in no time.

Shows a monthly calendar at your request.

Audible alarm signals appointments, no matter what program you're using.

Schedule standing weekly meetings for automatic posting to your daily schedule.

Schedule meetings in 15, 30, or 60 minute increments.

Alerts you to overlapping meetings.

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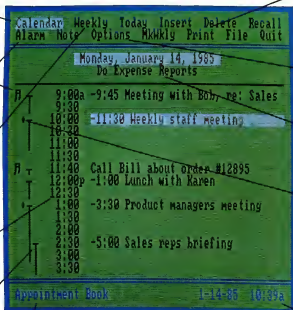
Print all or part of your schedule.

Customize the format of your Appointment Book.

Make a note for the day.

Standing weekly meetings are shown differently from scheduled meetings.






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	PHONE BOOK Only Spotlight's autodialer adds long distance access codes as needed. Quickly finds a number from up to 18,000 automatically sorted phone listings. Includes extra room for addresses. Accurately sorts international characters.
	NOTEPAD Only Spotlight lets you call up a notepad, jot down information, and automatically file up to eight pages of notes to use in another program. Edit your notes and print them out as needed.
	INDEX CARD FILE Only Spotlight lets you create a mini-database of information. Stores up to 36 different categories of information with 500 information cards in each. Perfect for client lists, inventory, or part numbers.
	CALCULATOR Only Spotlight solves math problems with a 12-digit business calculator. Provides a visual map to your keyboard. And lets you instantly paste answers back into the program you're using.

Spotlight runs with every major program for the IBM® PC, XT™, or AT™. With this kind of productivity and control at your fingertips, Spotlight is truly a businessperson's tool, not just another software gimmick.

Stop by your nearest computer dealer and ask to see Spotlight, the desktop manager that means business.

System requirements: IBM® PC, XT™, or AT™ or COMPAQ® portable computers, one disk drive, 75K memory for RAM resident portion, DOS 2.0 or higher. Printer optional. Can be installed on hard disk. Runs with most IBM PC software.

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By Software Arts™

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**Sooner or
later, you'll have
to face
this computer
problem.**

PC MAGAZINE • MAY 15, 1984

Do your eyes itch, burn, or tear? Are they tired and sore? Do you get headaches, occasional dizziness, or blurred or double vision? If you have any of these symptoms, you're probably suffering from eyestrain and fatigue, and it may be from using your PC.

Eye fatigue and other vision problems are common for regular users of PCs and other kinds of video computer displays. This visual stress can also contribute to general tension and tiredness. Fortunately, vision problems experienced by video display users have

Better sooner.

Better Sooner.

Computers don't ever get headaches.

But the people who use computers do.

Quite clearly, as PC Magazine spells out, that's not the only trouble they're having.

In case you're tempted to dismiss this as trivial, there are two things you should be aware of:

First, more than twenty states are already preparing legislation to force some improvements.

Second, if computer users suffer, so does business.

Because computers are only as fast and accurate as the people who operate them.

You are not a machine.

Computers are designed by engineers.

They usually know a lot about technology but very little about people.

Which is why so many computers are technically impressive but strangely unnatural to use.

Computer-induced problems (%)

Eye strain	55%
Back pain	43%
Headaches	30%
Shoulder	25%
Hand/wrist	18%
Neck pain	15%

(Source: "Ergonomic Principles in Office Automation" Pub. 1983 by E.I.S. AB, Sweden.)

Ericsson, in its very Swedish way, has always believed that excellent ergonomic design isn't a privilege.

It's a right.

That it isn't a noble gesture but demonstrably good for business.

It's an attitude that has made Ericsson No. 1 in Europe twice over: First, as the giant of European telecommunications.

Then again as Europe's biggest workstation company by far.

(You couldn't ask for a better marriage of technology for the future.)

Here is one example of how they got there.

It's the first of a whole range of computers to be introduced in the U.S.A.

The Ericsson P.C. It's Ergo-Intelligent.™

Ericsson has spent \$300 million finding ways to make people and computers work better together.

Here are some of the results.

Ergo-Screen.™

Aspirin gets rid of a headache. Ergonomics gets rid of the cause.

The Ericsson PC monitor has a non-glare screen.

With restful amber characters on a specially developed, low-fatigue background color.

Even the shape of the actual characters was specially developed to allow easier recognition of difficult to distinguish letters like O and Q.

On the monochrome monitor, the resolution is double that of IBM's, so clarity is remarkable.

You can even have characters and graphics on the same screen.

Ergo-Arm.™



Thousands of people get neck and muscle pain from inadequate height and angle adjustment.

The Ericsson Ergo-Arm lets you move your screen exactly where you want it.

Better than back pain, wouldn't you agree?

Ergo-Touch.™

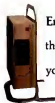
The keys are full-size and the layout is ergonomically planned for greater accuracy and speed.

Yet the keyboard is 20% more compact and less than half the weight of IBM's.

Even the cord is adjustable to suit left- or right-handers.

Ergo-Color.™

Even the color of the case is ergonomically selected to be restful to the eye over many hours.



Ergo-Space.™

The system unit is one-third smaller than IBM's.

It even fits under your desk in a vertical rack.

So your desktop is your own again.

IBM Compatible.

Many companies claim to be compatible.

Some are. Some are stretching the truth.

The Ericsson PC boasts the highest compatibility rating there is. It's operationally compatible.

You can take advantage of thousands of PC-compatible programs already available.

In fact, with the best-selling software, the program and data disks are interchangeable with those of the IBM PC.

Service. Not Excuses.

Ericsson wouldn't give you anything less than on-site or carry-in service. The choice is yours.

3 Free Offers.

Ericsson will send you revealing literature on ergonomics.

Also a detailed brochure on the Ericsson P.C.

And arrange a hands-on test if you ask for it.

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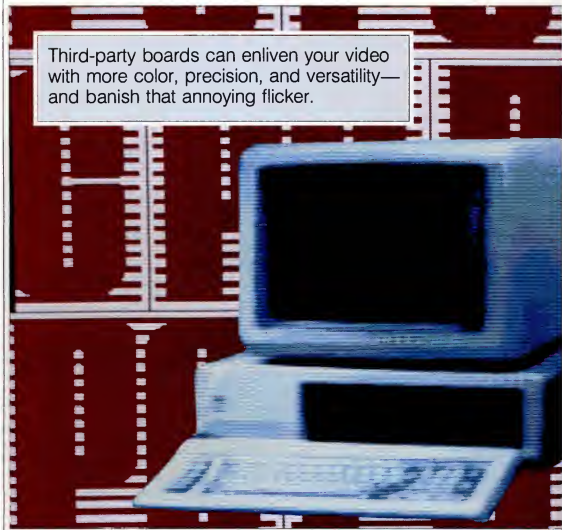


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COVER STORY • GLENN A. HART AND JIM FORNEY

ADAPTED FOR

Third-party boards can enliven your video with more color, precision, and versatility—and banish that annoying flicker.



THE SCREEN



VIDEO ADAPTERS

Among the myriad IBM-compatible boards introduced by third-party manufacturers, one of the most popular categories is video boards. Unlike memory and I/O boards, which have a stultifying similarity, video adapters offer tremendous diversity in function and price. Color boards, especially, have proliferated almost like weeds. Each claims performance superior to the IBM color card, which isn't hard considering the limited resolution and color capacities of the Big Blue card and the horrible flickering caused by its cheap hardware design. Most such boards actually deliver what they claim, and even the simplest ones, which merely emulate the IBM exactly, are almost invariably a better choice than the IBM version (unless you want IBM to service your system).

Several color boards are available that offer higher resolution and/or more colors at a given resolution than IBM's standard. Perhaps the most popular is currently the Plantronics Color-Plus, which offers four colors at 640- by 200-pixel resolution (compared with IBM's white on black at

640 × 200) and 16 colors at 320 × 200 medium resolution. And it works perfectly with programs calling for a standard IBM color adapter.

The monochrome adapter alternatives have been much more limited, possibly because the IBM mono card is a far better performer than IBM's sickly color board. The IBM monochrome font is detailed, well designed, and easy on the eyes. The excellent IBM monochrome monitor is a fine choice for business and general use, although some users do not like the long-persistence phosphor and the resultant ghosting. A handful of combination boards that combine standard IBM mono and color modes have appeared. Boards like the Paradise Multi-Display card save one slot and a few dollars and work well within the limitations imposed by the IBM standards.

The first mono substitute to achieve significant sales has been the Hercules graphics board. This is a card that does everything the IBM mono card does, with one major enhancement—high-resolution graphics that can be displayed on the standard monochrome monitor. Compared with the IBM color card's "high" resolution of 640 × 200, the Hercules can dis-

play 720 × 348 on the mono monitor. Because mono monitors already have an inherently higher resolution than RGB color screens, adding a mono substitute board can give impressive results.

Unfortunately, there are a couple of hitches. The Hercules achieves its high resolution by using both the memory buffer originally designated by IBM for monochrome and the one designated for color display. Until recently, this design precluded adding any color board to a Hercules-equipped system. Without special provisions, a color card can't even be plugged into the bus without conflict. If no color is needed, there's no problem, but if an important program requires color, the Hercules owner may be out of luck.

The "may" part brings us to the second problem. The Hercules does not even attempt to emulate the IBM color standard; so color-oriented software that adheres to the normal IBM requirements definitely won't run on the Hercules or boards that emulate the Hercules. The software supplier must totally rewrite the programs to allow the Hercules to display graphics on the mono screen. While the Hercules has become popular enough to motivate a few system houses to create

COMPUTER/VIDEO ART FOR PC MAGAZINE

The art shown here was created by PC magazine's art director Gerard Kunkel in collaboration with Rob Cornet of Chorus Data Systems, Inc. First, they captured the image of a PC and erased a window for the computer screen (left). Next, a three-quarter view of Rob's face was captured and set inside the window (center). The third image, Gerard's hand, was silhouetted and put in position to hold the window image (right). In the final stage, the three images were combined and silhouetted, and a new background was inserted.



special Hercules versions (most notably Lotus's *1-2-3*, Microsoft's *Word* word processor, and the excellent *AutoCad* drafting package), the list is still small compared to the number of programs that use standard IBM color protocols.

The Expanding Universe

The video adapter picture has become both more interesting and more confusing as new video cards have been introduced. The following series of articles examines a representative sample of the new boards and shows you what they can do. We've found it helpful to divide the new video boards into four broad categories.

One is combination boards that attempt to combine the best of both worlds—high-resolution graphics on a monochrome monitor and enhanced color modes on a color monitor. Such boards claim to offer improved performance, sometimes with cost savings as well, but a few sticky issues must be raised.

Combining high-resolution mono and high-resolution color is all well and good, but if the method is not compatible with off-the-shelf software, the improvements may well be meaningless in the real world. Supercolor modes that can be used only if

you program the output (a far from trivial task) may render the new contender useless. With so many boards and alternative methods appearing, it's simply impossible for software houses to modify their products for each new entrant. Only a few high-performance color adapters (primarily

Color boards, especially, have proliferated like weeds, and each claims performance superior to IBM's.

ly the Plantronics and Tecmar) have generated enough sales for any software support from independent software suppliers. In monochrome, only the Hercules is in this position.

In spite of this limitation, new hardware having no compatibility with any-

thing but the IBM standard continues to appear. The manufacturers with whom we have discussed this situation seem to suffer from the delusion that their hardware is so compellingly good that software suppliers will simply have to modify their programs to use the boards' idiosyncratic designs. Since software houses haven't done so for already well-established boards, it is unlikely they will for the more obscure boards.

Another problem with most of the new designs is that they don't allow both color and mono monitors to display simultaneously, even though their advertisements show two monitors happily radiating at the same time. One manufacturer suggested to us that this kind of advertisement was permissible "artistic license." We think not. Many users own both types of monitor, and simultaneous display may be important to them.

A related issue is whether both monitors can be connected at once. Several new designs have only one video connector, which obviously precludes hooking up two monitors. In other cases, the manufacturers suggest disconnecting whichever monitor is not being used in order to avoid synchronization problems and dam-



CONFIGURING A SAMPLE VIDEO CAPTURE SYSTEM

It took a lot of equipment to create the art for this article. The primary system included an IBM PC-XT with 512K RAM, an IBM monochrome and parallel printer adapter, and an IBM monochrome monitor. To this basic system Gerard Kunkel and I added the Chorus Data Systems PC-EYE 6-bit Video Capture System, which received its video input from a JVC GX-66U video camera equipped with a 12.5-75mm zoom lens. Initially, we viewed the actual video image on a Sony KX-1211HG composite monitor that was driven by a Chorus Data Systems Colorverter with external slide control. We manipulated the images with a Microsoft Mouse and viewed them on an Electrohome High Resolution Data Display that was driven by a Revolution Board from Number Nine Corporation. The applications software was *IMIGIT*, manufactured by Chorus Data Systems, in an IBM PC-DOS 2.1 environment.

—Michael O'Come

VIDEO ADAPTERS

age to the monitor not in use.

Specialized and Advanced

Our second category of adapters is advanced monochrome boards that offer alternative text resolutions. Several products offer 132-column display in addition to the normal 80 columns. This parallels the distinction between 80 and 132 columns found in freestanding terminals used with non-PC computers. Since most wide-carriage printers produce 132-column printouts, a 132-column video display is useful in showing how wide hard copy will look. A 132-column display is also especially helpful with spreadsheets and database programs.

Two things to consider with 132-column displays are legibility and usability with normal software. Characters on a 132-column display are smaller than those displayed in 80-column mode; so the monitor must be sharper, or else the characters become difficult to decipher. The IBM monochrome monitor does a fine job of displaying 132 columns, as do some third-party monitors, but not every monitor is up to the job.

Even if the monitor can produce clean characters, some users may find the characters too small to read comfortably. The most common 132-character display mode has 44 lines of text, but some now offer 25- or 28-line displays to make each character somewhat larger.

Not all software will work with 132 columns, whatever the number of lines, while other programs won't allow more than the standard 25 lines. It is possible to patch some programs to accommodate the denser display formats, but many programs can't be modified or don't provide the information necessary to perform the patching.

Our third category of adapters is advanced color boards. This includes the more or less standard boards that offer more colors at a given resolution but also encompasses fascinating boards that offer unprecedented color performance. Several such cards make use of the new 400-pixel-

line monitors to produce seamless color graphics and high-resolution text that can approach the quality of a monochrome text display. Some even use the NEC 7220 graphics controller and associated graphics hardware to write their high-resolution graphics at much higher speeds than that at which software can generate graphics.

Compatibility is a major issue with

We had little trouble getting the products to perform as advertised—a testament to the consistency of IBM hardware design.

such boards. Some cards maintain compatibility with IBM color programs, but there are several others that do not. These boards require customized software or programming from scratch. We've examined a couple of boards like this, and they are impressive performers. But they may, in fact, be intended for original equipment manufacturers (OEMs) and developers who will integrate them into complete graphics systems, and not for the average PC buyer looking for a new video card.

Finally, a catch-all category includes some unusual products that defy other categorization. We've looked at boards that add on to a normal video card to produce subtle colorations on analog RGB monitors, freestanding graphics devices that can interface to any computer, and so on. One of the fascinating aspects of PC ownership is the wide spectrum of devices you can use, and even more interesting graphics devices will probably be introduced as

interest in graphics on the PC continues to build.

Using the Chart

The chart that accompanies this series is intended to help you evaluate whether a given board meets your needs. The Physical Characteristics section tells you if the card will need more than one precious expansion slot, what kinds of monitors can be connected, whether a light-pen interface is provided, and so on.

The Monochrome section indicates whether a board supports the 132-column mode and what kind of high-resolution mono graphics is available. Hercules compatibility, software compatibility, and other issues are indicated. The Color section indicates what kinds of displays are available in terms of resolution, the number of colors at a given resolution, software compatibility, and the like. The Other Features section indicates what add-ons, such as system memory (memory used by the CPU as part of its normal address space, not display memory), serial, parallel, and game ports, and so on, are provided as standard or optional features and what they cost.

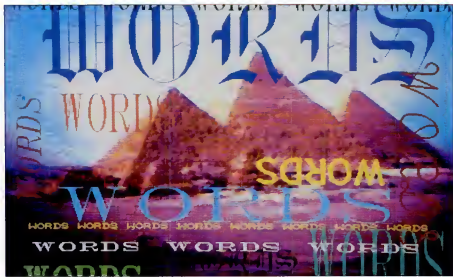
Finally, the Performance section summarizes what we found in our tests. Since it's very difficult to capsuleize the performance of complex products like these in a chart, you should rely on the text report on each product for the details.

Evaluating so many video boards has been an interesting and challenging task. While we found many similarities, we also were fascinated by the diversity of design and function. We had surprisingly little trouble getting the products to perform as advertised—a testament to the consistency of the IBM hardware design.

This is an exciting time in the micro-computer graphics field. Both hardware and software are advancing at a rapid pace. More detailed, faster, and more capable graphics are a certainty. As always, the beneficiary will be you—the user. ■

This video board beauty contest features 25 contestants: Some are good, some bad, and some are just plain ugly.

VIDEO BOARD REVIEWS



AMDEK MULTIPLE ADAPTER INTERFACE

Amdek's MAI (Multiple Adapter Interface) board tries to be an "all-things-to-all-people" universal monitor card. In some ways, it does so rather handily, but in other areas, I was disappointed. It supports creation of up to eight pages of text storage on both high-resolution (640 × 400 pixel) color monitors and monochrome monitors. It also provides a parallel printer port and a high-resolution light-pen interface.

User Memory—for Some

The MAI card has an erasable UV PROM to allow for easy modification of character sets for special applications or languages. It also has 128K of on-board RAM, part of which is reserved at all times for board functions. However, if the RAM sockets on your system board are fully populated, you can map off up to 96K as user RAM, depending on your application and the DIP (dual in-line package) switch settings.

Unfortunately, through no fault of Amdek's, that's sort of a "Catch 22," because the person who needs that extra memory most likely has only 64K or 128K on the system board, in which case the board's user memory is inaccessible. And by the time a user loads the system up to 256K (less on earlier PC system boards), the board's extra 96K isn't going to be nearly as important.

Then, if you do use the available RAM to add to what you have in your system, you reduce the size of the video buffer and the number of pages (screens) you can access for graphics.

Perhaps my biggest disappointment with the MAI board came when I used it for text editing with a high-resolution IBM

screen. Amdek's own monochrome monitors are not high resolution, and this board failed to take advantage of the higher resolution offered by the IBM monitor. The MAI board would not, for instance, resolve a monochrome separation test pattern that all the other boards I tested handled without much difficulty. And that group included both strictly monochrome boards and combination types operated in the mono mode.

Character Defects

While for the most part, one character set looks pretty much like another, there are some notable exceptions here, especially with the *m* and *w* characters. The lowercase *m*, in particular, is rather poorly formed, with the middle leg trailing off to nothing before it gets to the bottom. This leaves you with sort of a lump at the top of the *m*; the bottom of the *w* has the same kind of lump. To make matters worse, these lumps seem to jump out at you, noticeably brighter than the good parts.

Scrolling with the MAI board was fairly smooth, and its performance with an RGB monitor was satisfactory. But because it doesn't do anything special that IBM's own card doesn't, and because of the lower resolution, I consider the Amdek to be the bottom-of-the-line card out of those I reviewed.—J.F.

AST MONO- GRAPHPLUS

IBM's monochrome card doesn't do graphics, and that's one of the best reasons not to buy it. The new MonoGraphPlus from AST handles the graphics nicely while also providing a parallel port for your printer plus an onboard clock/calendar. And it's easy to use. As soon as you plug it into an expan-

sion slot, attach your monochrome monitor, and power up, you're ready to go.

Near-Clone

Compatibility with Lotus's 1-2-3 seems to be the benchmark by which monochrome graphics cards are judged, and AST's new entry meets the test. To use any monitor card with 1-2-3, you must

AST creates an extra line by stealing one row of pixels from the raster of each of the normal lines in text mode. Suprisingly, the loss of resolution is virtually imperceptible.

install an appropriate driver on your Lotus disk. Interestingly enough, however, there is no driver specific to the AST card. Instead, the instructions state, "Install the same Lotus 1-2-3 driver program on your Lotus disk as you would for a Hercules Graphics Card." So what we have in the AST card is an almost perfect Hercules look-alike, except for the on-board clock and calendar.

I found the AST board looking even more like a clone when I started trying it with software marketed specifically for Hercules. It even seems to run the Hercules Graph X package at least as well as the genuine article. But the MonoGraphPlus isn't strictly a clone, for, unlike the Hercules, the AST requires no software of any sort to configure it for graphics.

Everybody has to have a gimmick these days, and AST's is a character line added to the monitor screen. It's optional, and to

bring it up you have to use a program called NEWLINE.EXE from the disk that comes with the board. AST creates the extra line by stealing one row of pixels from the raster of each of the normal lines in the text mode. Surprisingly, the loss of resolution that results is virtually imperceptible.

But NEWLINE is AST's line, not yours. It sits at the bottom of the screen and tells you the current default drive and path, the current status of the CapsLock, NumLock, and ScrollLock keys, and the time of day. I didn't find this feature to be much of a plus.

Bonus Lines

However, the AST MonoGraphPlus *Technical Reference Manual* that comes with the board tells you how to call up a 26th and even a 27th line of your very own by reprogramming the CRT controller. A simple program added to the disk could have unlocked those lines for any user, but none is included.

There's really nothing new involved in adding the 26th and 27th lines. The choice has been there for the taking—or should I say the programming—all along. In fact, AST's NEWLINE program will bring up a 26th screen line on a Hercules card. The program isn't entirely compatible with the Hercules (part of the extra line repeated at the top of the screen, garbling part of the regular text in that location), but it proves the point.

The AST MonoGraphPlus board's built-in clock/calendar tells DOS the time and date whenever you boot your system. It's a nice feature and is standard on several of AST's other boards as well. While the clock/calendar circuit is probably the same as on earlier boards, AST has changed the software, combining two programs into one with a saving of less than 100 bytes. Both sets of software seem to work.

When it comes to the things that are really important when you're buying a strictly monochrome board like this—the quality of the graphics and the character

set for text—the new AST MonoGraphPlus is a top-notch performer that looks like it's going to be hard to beat.—J.F.

COLORMAX MULTI DISPLAY

The Colormax is a multipurpose video display adapter that can perform the same functions as both a standard IBM monochrome adapter and an IBM color adapter. It also claims to be able to display graphics generated with the normal IBM color card on a monochrome monitor and includes an IBM-compatible parallel printer port.

Three groups of jumpers must be set to adjust the board to the user's configuration. The slightly cutesy manual explains the settings clearly. The Colormax can drive an IBM-type mono monitor, an RGB color monitor, or both; it can also handle a composite monitor. The board itself is not full-length, but neither is it short enough to fit the short slot in the PC-XT.

Black Snow

I tested the Colormax connected to both an IBM monochrome monitor and a Princeton Graphics HX-12 RGB color monitor. The monochrome display emulated the normal IBM mono display with no problems. Some black snow was visible in screens with reverse video, indicating that the hardware design does not include the special provisions necessary to avoid this effect. Scrolling speed was the same as with an IBM card, or perhaps a tad faster.

Micromax does not provide any software with the card but does include two short BASIC programs that can be used for switching between mono and color. These programs work well, except that once the board has been switched to color mode, the act of leaving BASIC seems to return

the system to the mono mode.

Flicker and Roll

Color display was fine and behaved much like an IBM color adapter without the annoying flicker. In color mode, the monochrome monitor rolled vertically and was unreadable. Micromax instructs the user to adjust the vertical hold to eliminate the problem, but neither the Princeton Graphics MAX-12 nor an IBM monochrome monitor has a vertical hold control accessible to the user. I have heard an unconfirmed report that color-mode displays do not work with all monochrome monitors and are difficult to engineer because of the different scan rates used in mono and color monitors, so this could be the problem as well. In any event, it was not possible for me to get a usable display of color graphics or text on either an IBM monochrome monitor or a Princeton Graphics MAX-12 amber monitor.

The Colormax switches between monitors automatically if the application software calls for this switching. For example, 1-2-3 displayed text on the mono screen and graphics on the color monitor when installed with the "both" drivers. The graphics were also visible on the mono screen, but with the vertical roll mentioned above.

The parallel printer port worked well. The Colormax automatically switches the port address between LPT1: when the board is in mono mode and LPT2: when it is in color mode. This mirrors the standard addressing used by IBM and is handy when another video adapter is used with the Colormax.

The Colormax does serve well as both a monochrome and a color adapter. I cannot be as sure that displaying color on the mono monitor can be made to work. Several competing cards (the popular Paradise MultiDisplay board, for example) do what the Colormax does except for attempting to display color output on a mono monitor, and the Colormax doesn't seem to offer any particular advantage.—G.A.H.

(continued)

DISCORTEx CX-1 COLOR TRANSFORMER

The CX-1 Color Transformer from Discortex Corporation is not a video adapter board. What, then, is it doing in this review series?

The Color Transformer is a short card that enhances the performance of any normal color video adapter. In a way, it is analogous to the piggyback cards that plug into some of the video boards that we've reviewed, but it works with any standard color card.

Most enhancement boards add display memory to allow higher resolution or more colors at a given resolution. The Color Transformer doesn't work that way. Instead, it gives you a palette of 262,144 colors!

Analogue Answer

But doesn't an IBM-type RGB monitor have only eight colors in two intensities, for a total of 16 possibilities? Aren't these monitors Digital TTL (transistor-transistor logic) so the output levels are either on or off? Right on both counts. The catch to the Color Transformer is that it needs an analog RGB monitor. An analog monitor works very much like a regular IBM digital RGB, except that the color drive levels can be varied continuously. And the Color Transformer produces its astonishing palette by adjusting the output level of each of the three color guns to any of 64 levels, giving $64 \times 64 \times 64$ possible combinations.

The Color Transformer is installed in series with the normal color adapter. The output of the standard card is connected to the Color Transformer with a supplied short cable, and the analog RGB monitor is connected to the Discortex board. The Color Transformer's lookup table transforms the output of the color card, and

three high-speed, digital-to-analog converters generate the appropriate analog level to send to the analog monitor. Up to 16 colors can be displayed simultaneously if the normal color adapter is capable of generating that many colors.

I used a Plantronics Color Plus, a very appropriate choice for use with the Color Transformer. The monitor I used was a Sony CDP-1201, an excellent and beautifully styled high-resolution monitor capable of both digital and analog RGB.

Installing the Color Transformer required nothing more than plugging it in and making the connections to the color card already in the system and to the analog monitor. The system boots and runs normally, with the Color Transformer playing no part.

Activating the Color Transformer involves running some BASIC software provided by Discortex. The BASIC programs are very well commented and clearly indicate the simple programming necessary to set up and use the Color Transformer. A utility is supplied to generate, modify, store, and recall any of four distinct palettes. The manual clearly indicates how to disable the Color Transformer for normal operation, how to initialize the board, and how to use it. You can store palette sets on disk for future use, and you can BSAVE or BLOAD pictures. Discortex also supplied several sample pictures to test and demonstrate the system for this review.

Mellow Tones

The Color Transformer can produce some lovely colors never before seen on a normal IBM system. The demo software allows interactive adjustment of the level of each gun, and it is fun to play with the output levels to see the colors that can be created. The visual effect of changing one gun by only one level is subtle in most cases, but changing a gun's output by five or ten levels produces a color change that's quite noticeable. It's also easy to set up a good gray scale.

After setting up an unusual palette, I loaded Lotus's 1-2-3 to see if the new col-

ors would be retained. They were. Some other programs, however, ignored the new palette and used the standard IBM colors. The determining factor may be whether the software writes through BIOS or sends data directly to the video hardware, but this is only a guess. A user programming in BASIC or other high-level languages that can write directly to an output port will have no difficulty in using the Color Transformer.

The Color Transformer works exactly as claimed and is reasonably priced at only \$295. My real question is, Who will want the board and for what purpose? Discortex says the gradual changes in adjacent colors can add shading and realism to business graphics, and sometimes research and medical systems use gray scales and color gradations for quantitative image assessment. For these applications, the Color Transformer would be a significant enhancement. But the added cost of an analog monitor and the uncertainty of using the product with commercial software indicate that the Color Transformer is a rather specialized product. If you create your own software and either need or want a very wide spectrum of colors, the Color Transformer is a gem.—G.A.H.

EVEREX GRAPHICS EDGE

The video board that claims to offer more pure video functionality than any other tested is the Everex Graphics Edge. Everex claims complete Hercules and IBM compatibility in monochrome and Plantronics and IBM compatibility in color, all on one full-length normal card occupying one standard slot. For good measure, the card also has its own superextended color graphics mode with even more color selec-

tions at high-resolution than the Plantronics (a full 16-color palette at 640- by 200-pixel resolution), and a 132-column by 44-line, high-density monochrome text mode, too! A parallel port is thrown in for good measure, and the board costs only \$499 retail, less than the Hercules or the Plantronics alone!

Installation is a plug-in-and-go proposition in most situations. The board has five jumpers, but the factory settings are usually correct. The jumpers control several Wait-state options. The Wait states concern tradeoffs between speed of display and generation of so-called white snow or black snow and flicker. The black-snow effect is caused by interaction with the refresh rate of the dynamic memory used in the PC. White snow occurs only in the high-resolution Everex color mode because of the high bandwidth required by Everex extended graphics. There simply isn't enough time for the 64 bits of required information to register without the Wait state. Fortunately, the Wait state required to eliminate the annoying white snow affects only the Everex extended graphics color mode and doesn't slow down either IBM or Plantronics color; so it should be used in almost every installation.

Everex provides a table clearly spelling out the various combinations and the pros and cons of each. The documentation is clear enough for technically oriented users, but it may be tough sledding for the uninitiated. Some expansion chassis (like my Sigma) do not implement Wait states on their extension motherboards, and so the options available are more limited.

The rear edge of the board has two standard, nine-pin video connectors, one for an IBM-type monochrome monitor and one for an RGB color monitor. It also includes an RCA connector for composite video and a two-position switch marked "Color" and "Mono" to set the board's operating mode. A ribbon cable and an extra rear-panel insert are supplied for the parallel port.

Besides saving slots and offering many

options, the board is truly a delight to use. Standard monochrome performance is exactly like the IBM monochrome adapter (assuming no Wait states in the mono mode). The Hercules emulation is also perfect. Lotus's *1-2-3* and *AutoCad* worked perfectly. I also tested the newest release of Microsoft's *Word*, which offers Hercules owners the best of both video worlds. The excellent on-screen display of

The Everex does exactly what it says it will do with a minimum of fuss and bother and offers both Hercules-type and color graphics.

italics, superscripts and subscripts, and other niceties available on the color screen now display on mono monitors, but with the inherently superior text font of the mono mode. The Everex card handled *Word* just as a true Hercules card did. Even *BASICH*, the modified BASIC supplied with a Hercules board, performed as expected.

The 132-column by 44-line display can be used only with software that has been patched for such a dense display. PC-DOS and IBM BASICA do not allow the large display, but a patched version of *WordStar* worked fine. While the characters in 132-column mode obviously are smaller than normal, readability is excellent—far better than some high-cost, 132-column terminals I have worked with in the past. The 132-column mode would be handy for word processing of tables and special charts, but the real advantage of 132 columns would be with spreadsheets. Maybe Lotus, Sorcim, Microsoft, and the other

spreadsheet suppliers will make the necessary patch points public, or perhaps Everex can figure them out.

In the color mode, the Everex ran every program I could find that used the standard IBM color mode. Its performance was much like other IBM-compatible color boards; it was faster than IBM's board and avoided the annoying flicker. I own a Plantronics Color-Plus, and software designed specifically for that board also ran on the Everex with no problem.

Everex supplied a demo of its proprietary 16-color, high-resolution, extended graphics mode, and that was a knockout on my Princeton Graphics System color monitor. (An interesting by-product of the extended graphics mode is that the original version of Microsoft's *Flight Simulator*, the one that does not support RGB monitors, can display much more color if the Everex TEST16 demo is run first and interrupted during operation. Evidently, the Everex gets locked into its extended mode and *Flight Simulator* uses the extended color capabilities.)

Color in Green and White

Color-mode displays are also visible simultaneously on a connected IBM-type monochrome monitor. This allows a user who has only a mono monitor to run programs that use IBM color graphics. The color-mode display on the mono monitor occupies only about half of the mono screen but is otherwise excellent.

There are two methods of switching between monitors on systems with both color and monochrome monitors connected to the Everex. If the PC system board switch is set to indicate a color monitor and the two-position external switch on the Everex rear panel is set to Color, the system will wake up in the color mode and can be switched back and forth between color and monochrome with software provided by Everex. If you'd rather have your monitor wake up in mono, set the system board for a monochrome monitor and the Everex switch to Mono. Switching to color then requires issuing a command and

VIDEO BOARDS

manually moving the Everex switch. Remember to move the switch back to mono when the computer is restarted; otherwise, the system won't boot.

Programming the special 16-color extended graphics mode is quite a bit simpler than with the specialized color modes of some other boards, although it's still no garden party for a beginner. The Everex board has a full 64K of on-board RAM, which can be bank-switched in 16K segments to increase the available memory. You can even use the BASIC interpreter to write to each bank and switch between them by changing the value in a register. Some very impressive color video effects can be generated that way.

Finally, the parallel port worked normally as LPT1: No provision is made to change the addressing of the parallel port (although a jumper can disable the port entirely), so users with other parallel ports in their systems may have to juggle addresses a bit. Fortunately, the parallel port on the video card is usually addressed at LPT1: in most systems, and so the Everex should not present any major problem for most users.

If you've gotten the impression I like the Everex Graphics Edge, you're right. It does exactly what it says it will do with a minimum of fuss and bother. It is one of the few setups that offers both Hercules-type monochrome graphics and color in one system.

I also like Everex's choices of Hercules and Plantronics as emulation models, since these are the most popular boards of their types, and some good software is available for the special modes. Everex's own superextended color graphics and the 132-column mode are potentially useful as well.

The fact that all this actually works and is priced at only \$499 is simply remarkable. It is difficult to contemplate anyone's buying a standard Hercules or Plantronics board when they could have the Everex for the same or less money than either competitor alone. I think Everex has a winner here.—G.A.H.

EVEREX GRAPHICS PACER

Slot space has always been at a premium in IBM Personal Computers. There are only five slots in a PC and eight in an XT (including three short slots that won't accept full-length plug-in cards). One slot is always occupied by the floppy disk controller, and hard disk users have to devote one to the controller for that device as well. Another also has to be allocated to whatever board is used to generate video for the display, and if both monochrome and color video are desired with standard IBM cards, one more slot disappears. The situation in many portable PCs is usually even worse, with fewer slots engineered into the cramped confines.

The innards of my test system looked lonely and empty with just the Graphics Pacer installed.

Add memory, parallel and/or serial input/output ports, a clock/calendar, a mouse interface, or any of the myriad other possible expansion functions, and the available slot count reaches zero very quickly. The memory-oriented multifunction cards help quite a bit, but expansion is like a gas—it fills the available volume immediately.

The new Graphics Pacer board from Everex Systems Inc. consolidates both video and floppy disk control on one full-length expansion board. The video is not just standard IBM-compatible mono-

chrome, either; it includes high-resolution monochrome graphics fully compatible with the Hercules design that has become an actual standard. This helpful amalgamation is enhanced further by the inclusion of a parallel printer port.

All this fits on a standard full-length single expansion card. The board is narrow, with no parts extending very far from the board, and so it should work well in XTs and other systems with narrow spacing between the card connectors.

Easy Pace

Installation is trivial. The only jumper to set determines if the floppy controller section is enabled (why anyone would buy this board and *not* use it as a floppy controller is beyond me). The preliminary documentation is sketchy and doesn't indicate which way to connect the supplied two-drive cable, but most floppy drives have pin 1 and pin 34 marked, as does the connector on the cable; so it isn't difficult to plug the cable in correctly. No changes to the floppy drives or their jumpers are required. The rear of the board has a 9-pin connector for a standard IBM-type monochrome monitor and a 25-pin connector for the parallel port. There are no switches to set other than the motherboard switch on the PC to tell the system a mono monitor is in use.

The test system booted normally with the Graphics Pacer in place; so the floppy control section worked as it should. I did not have any difficulty at all with floppy operation during the test period.

Video was equally trouble free. Normal DOS displays seemed a bit slower than with a standard mono card, but the difference was minor if it existed at all. The Graphics Pacer does not have the Wait-state provisions or requirements of Everex's Graphics Edge, and so perhaps some compromise was made in speed versus black-snow generation (see review of the Graphics Edge in this series).

Lotus's 1-2-3 worked perfectly when installed for a Hercules board, as did AutoCad, Microsofts Word, Framework, and

other programs capable of using the Hercules mode. As always, Hercules graphics were delightful—crisp and detailed.

The innards of my test system looked lonely and empty with just the Graphics Pacer installed. Both the graphics and the floppy disk control functions worked exactly as expected, as did the parallel printer port. There is no provision to change the address of the printer port to anything other than LPT1, but this should not be a problem in a system likely to use a Graphics Pacer.

The Graphics Pacer board is easy to install and easy to use, and the Hercules graphics capability is, as always, highly desirable. Other boards offer various combinations of video and other functions, but the Graphics Pacer is a major contender at its price.—G.A.H.

HERCULES COLOR CARD

Right out of the box, the Hercules Color Card goes into an empty expansion slot, ready for you to plug in an RGB monitor (or a composite monitor via a plug-in adapter) and go to work—no jumpers, no software. For most applications, it's just that easy.

The Hercules Color Card is so nearly identical to the IBM Color/Graphics Card that it's almost uncanny. It can interface with light-pens compatible with the IBM board, and when I ran it with one rather snobbish system that won't work with just any old board, that system couldn't even tell the difference.

But the Hercules has the same shortcomings as the card it emulates. And certainly one of the worst of these is the flicker scrolling that plagues its Big Blue cousin. Both cards seem to manage scrolling through a block of system RAM rather than dedicated or even semidedicated on-board memory. Of course, that helps to

keep both the cost and the size of the board down.

Card Partnership

However, the way the Color/Graphics Card deals with the 64K of available video buffer should be good news to anyone who uses a Hercules Graphics card for high-resolution monochrome graphics but also needs a color card in the system. Unlike most other color cards that demand at least 32K of the available buffer space at all times, the Hercules Color card has been designed with a software switch that makes it stand aside and let its monochrome cousin have the whole 64K when necessary. Or it can share the buffer fifty-fifty when the mono card isn't hogging it. These two arrangements are in just about all of the software written for the IBM PC requiring high-resolution graphics. As a practical matter, it's the only color card that is fully compatible with the popular Hercules monochrome card.

And there's more good news in the size of the Hercules Color Card because, unlike the genuine IBM article, it is a half card and will fit a short slot like the one in the XT. Still, I had a problem fitting the Hercules board in my PC because the circuit board was about 3/32 longer than it should have been, which pushed the card-edge contact area too far forward to match up with the socket on the system board. It wouldn't go in the end slot at all, and only with some difficulty did I manage to force it into one of the inboard slots.

Port Pressure

Hercules has added a parallel port to its color card. However, as common as parallel ports are becoming on almost every conceivable kind of function card you can plug into a PC, another hard-wired port in your system can become a liability. My computer couldn't even find my regular parallel port a few times during this project when I had it configured to automatically take a back seat to any other port(s) in the system. DOS just won't accept LPT3;

and, in fact, the manual for the Hercules card warns of such possible port conflicts.

While you can do a lot of work with this card right out of the box—all the work that many of you would ever expect to do—some programming may be required to

There's more good news in the size of the Hercules Color Card because, unlike the genuine IBM article, it is a half card and will fit a short slot like the one in the XT.

adapt it to specialized applications. Roughly 85 percent of the manual is written "for advanced users," with appropriate memory address listings and hexadecimal codes to dig into if you like. However, most of that is a rehash of data readily available from IBM that would apply to virtually any color display card you might be using. I think Hercules might have done a little more by way of software support or documentation to help you explore some of the outer regions.

The Hercules Color Card comes in at less than half the suggested retail tag of some of the other boards I worked with. And if all you really need is a board to drive an RGB or composite monitor, do all the ordinary things a color card is supposed to do, and maybe double as a parallel port for your printer—or if you need full compatibility with a Hercules Graphics Card—this Hercules could be your champion.—J.F.

(continued)

HERCULES GRAPHICS CARD

This is a story about the first board I almost bought. When I bought my PC, I almost bought the Hercules Graphics Card for the monochrome monitor. I didn't do it, because I could see the need for color looming large on the horizon. But since the Hercules board had many desirable features, I'm glad to have a chance to look at it again.

Basically, there's something kind of friendly about the Hercules Graphics Card. Just plug it in and go! The Hercules has no little jumpers you have to fiddle with to make sure they came properly configured from the factory. As soon as you get the DOS prompt and type a few characters, you know you are communicating with the monitor, and a quick Shift-PrtSc command confirms that it has found your printer (parallel) and the two of them apparently can live happily together.

At this point, you're not set up to make the card do graphics. But you are up and running for text. If your PC is new to you and you need to get acquainted with it before you do anything else, you can put IBM's monochrome system demo disk or many programs' demos right in and start having some fun.

That may seem to be an unnecessary point to make, but the truth is there are cards out there that either don't run these well, or don't run them at all without some special software. So there's a degree of compatibility here that not all monitor cards possess. And if your needs are not especially demanding, you may never have to read past page 5 of the manual for the Hercules Graphics Card to get your money's worth.

But the Hercules card will do a whole lot more, with three software-selectable modes available to the user on Hercules cards manufactured in the past year or so.

The lowest level is simply a text mode, and it is the default mode at boot up. The second mode is called "half"; in this mode, you can do graphics requiring up to 32K of system video buffer—half of the total 64K available.

Unlike earlier Hercules boards, those designed to be used with the HGC software are compatible with having an IBM or similar color card in either the default (diag) or "half" mode, sharing with that card whatever buffer space the system provides. The "full" mode, however, is a completely different story.

Board Brawl

If you need the full 64K of video buffer for high-resolution graphics applications such as CAD/CAM packages, you'd better not have a color card in one of your other slots. Not unless it's the new Hercules Color/Graphics Card, that is. Most color cards will fight like cats and dogs for their fair share of buffer and are likely to crash your system in the process. But now, Hercules has its own Color/Graphics card (renewed in this series), a paraclone for IBM's card that's designed to stand aside when the mono card needs the whole buffer, or take its fair share when that's allowed.

For graphics, the Hercules Graphics Card uses a special offshoot of BASIC called BASICH; I would have been happier to see it compatible with BASICA. A minor point, perhaps, but in this world of incompatibilities or not-quite compatibilities, anything that eases that burden is certainly appreciated.

One of the things I liked was a little brochure that came packed along with the card. It lists a wide variety of applications packages requiring graphics that you can be assured will run properly on a Hercules card. It's a little thing, and yet not so little considering the questions of compatibility that do come up. Hercules at least seems to think enough of its customers to try to give them some guidance in selecting software that will perform properly with the board. Some software won't, one of the more

notable exceptions being Microsoft's popular *Flight Simulator*.

When Hercules modified its board design, albeit slightly, one of the software niceties the company managed to throw in was a "screen saver." Tacked on to a software command, it automatically blanks your monitor to save the screen phosphors when there's been no activity for 5 minutes. It's a nice feature, and when you return to fire it up again, pressing any key puts the screen right back where you left off.

Mixed Blessing

I generally prefer a monitor card like the Hercules that doesn't require the user to set up a bunch of little jumpers or switches on the circuit board, and the newer Hercules boards have none. However, the lack of jumpers and DIP switches on the Hercules Graphics Card can be a mixed blessing. This is especially true when you start adding other accessory boards to your PC.

The parallel printer port is a case in point. DOS will not address more than two parallel ports in your system at once, and with many of the popular PC enhancement boards passing out parallel ports as freely as a politician kissing babies, you can find you have too many ports, and two of them are fighting with each other. To avoid possible conflicts, it's nice to be able to disable one or more of the ports right at the board; you'll have to disable something other than the Hercules if you have a conflict. That's a pretty minor consideration, though, and hardly a detraction from the board's overall appeal.

The Hercules Graphics Card was high on my list of possible purchases when I first bought my PC, and looking back, it might have been a better choice than what I started with. A number of new boards have come along since then, some offering a variety of added features. But for a fine, unpretentious, no-nonsense, strictly monochrome card with graphics capabilities, the Hercules is still a worthy contender.—J.F.

IDEAGRAPH COLOR GRAPHICS CARD

IDEAssociates is a high-end manufacturer of various multifunction, communications, peripheral control, and other cards for the IBM PC environment. While individuals can obtain the company's products, IDE's main focus is on system builders, OEMs, and value-added resellers.

The IDEAGraph color board is, therefore, designed for such knowledgeable system integrators rather than the average PC user. By the time an end user sees an IDEAGraph, it will have been integrated into whatever hardware/software system is being purchased and will be working correctly.

The reason for this preamble is that the IDEAGraph is probably the most flexible color card examined in this project. It is capable of driving normal RGBI digital color monitors, RGB analog monitors, composite monitors, and even IBM-type monochrome TTL monitors. The card is equally happy operating in either interlaced or noninterlaced mode. You can use it with normal or high-scan-rate monitors of up to $1,024 \times 1,024$ resolution, but it works just as well in the limited graphics modes usually seen on a PC. It is, however, not intended to replace a normal PC video adapter and is not compatible with programs written for the standard color adapter.

At a Price

All this flexibility exacts a high price. While installing the board is pretty much a plug-in-and-run proposition, some rather sophisticated software must be run to match the board to the monitor being used. Terms like *horizontal front porch* and other arcane phrases appear. The job is not for a novice, but, after all, it isn't intended to

be done by a beginner.

The IDEAGraph itself is a full-length single board of excellent construction. There are four connectors on the rear edge, for Green/Sync, Red, Blue, and the standard 9-pin connector for RGBI TTL monitors. The board is available with either 128K or 256K display memory and with either a 24-MHz or a 40-MHz clock crystal. There are even Genlock and other options that make the IDEAGraph suitable for broadcast applications such as creating weather maps and other graphics. The fantastic NEC 7220 graphics controller is used for super-high-speed operation.

Novel Colorations

The IDEAGraph's resolution and color display capabilities depend on how much memory is installed. With 128K, 16 colors can be displayed with up to 256K pixels, allowing 512×512 , $1,024 \times 256$, or 640×400 resolution; 4 colors can be shown in $1,024 \times 512$ or 720×720 resolution; or 2 colors can be used with $1,024 \times 1,024$ resolution. With the 256K display memory, 256 colors can be displayed at 512×512 , up to 4 colors at $1,024 \times 1,024$. These color and resolution figures are way beyond what are normally seen in the PC environment. The higher resolutions require a long-persistence analog RGB monitor, but using the PC for such applications was unheard of before.

I tested the IDEAGraph with Princeton Graphics's SR-12 high-scan-rate and HX-12 standard RGBI monitors. The IDEAGraph software is extremely flexible, allowing many operating parameters to be set. Barry Krieger of IDEAGraph Engineering Group was both patient and helpful during this process. The standard HX-12 was no problem, but we did have to experiment a bit to get the SR-12 working well. While I was shipped a 40-MHz IDEAGraph, I changed the crystal to a spare 24 MHz I had on hand, because the reasonably primitive monitors were not fast enough to take advantage of the greater abilities of the 40-MHz unit.

Since both PGS monitors are digital

TTL, I was not able to display any more than 16 colors simultaneously, nor could I attempt the very high resolutions the IDEAGraph can produce. The IDEAGraph software included some simple demo programs, which were impressive and ran fast thanks to the NEC 7220 and good hardware design. The IDEAGraph also offers a cross-hair cursor, text, and animation features. A library of graphics primitives written in C can be used to create sophisticated displays.

While it is clear that I couldn't (and didn't) test the IDEAGraph completely without the appropriate monitor, I was quite impressed with what I did see. All displays were crisp and clean, with absolutely no evidence of flicker or glitches. The documentation was detailed, the IDEAGraph support group helpful and friendly. While there is little reason for the average PC owner to buy an IDEAGraph unless specific software calls for the board, if I were an OEM I would give serious consideration to the IDEAGraph.—G.A.H.

INNOVATION COLOR GRAPHICS/ PRINTER ADAPTER

What can I say about a color adapter that imitates the IBM color adapter card? While the INNOVATION

Color Graphics/Printer Adapter offers a couple of nice additions to the standard IBM color card, it also imitates the worst feature of the IBM card—the annoying and inexcusable flicker during scrolling.

The nice features, both of which work well, are the inclusion of a parallel printer port that is fully addressable as LPT1.,

VIDEO BOARDS

LPT2:, or LPT3:, and a single-dot font that is sharper than the normal double-dot font originally designed for color television rather than monitor displays. The terse and unfriendly documentation explains how to set the onboard jumpers before plugging the board in. Connectors for a light-pen and RF modulator are supplied as well.

But why the horrible flicker? Any number of IBM-compatible color boards, even inexpensive ones, have eliminated the problem. The board appears to be reasonably well built and has a low chip count, which tends to suggest reliable operation. I doubt that anyone would buy this board, however, especially after they've seen a color display that does not have the INNOVATION's flicker.—G.A.H.

MA SYSTEMS PC PEACOCK

The PC Peacock is yet another imitator of the IBM color card. It includes a standard parallel printer port and can display a single-dot character font as an alternative to the IBM double-dot format, but otherwise it does nothing an IBM card or any number of other cards can't do.

To make matters worse, the PC Peacock also shows the egregious flicker that plagues the IBM color card. I have already railed against this problem in other reviews in this series, so I won't here. Suffice it to say that the flicker is annoying and inexcusable.

The PC Peacock is a thick, double board with an integral piggyback board as part of the basic circuitry. It may be too wide to fit motherboards with narrow spacing or those in many portable compatibles. The chip count is large, which would tend to indicate less reliability in the long run. Why so many chips are necessary to perform functions available on

much smaller, competing boards is difficult to understand. Perhaps the board was designed some time ago, before circuits to emulate the IBM color board were as advanced as current parts allow.

Another problem with the PC Peacock surfaced when the COLORBAR BASIC program supplied with DOS was run. While all the colors were displayed correctly, bright lines of flickering dots appeared in several areas of the screen. These were not visible during normal program listings or other text displays. This problem probably indicates some faulty memory on the board.

The parallel port is addressable, and the single-dot font is desirable, too. The documentation is quite good. But the double board design, chip count, and flicker suggest that a seeker after a straightforward color adapter might be better off looking elsewhere.—G.A.H.

PARADISE MODULAR GRAPHICS CARD

Paradise Systems has introduced a new monitor card called the Modular Graphics Card, and although I got off to a rather bad start with it, once I got it up and running I found it to be an outstanding performer in some respects and good, at least, in most. A rather modestly priced card, its performance as a monochrome graphics board stands out because of the range of shades of green it will produce between bright and blank. And full screen, at that. It also has about the smoothest flicker-free scrolling I've seen.

The modular part of the name has to do with expansion capabilities built into the basic board. It's designed to carry two piggyback add-ons. These include such

options as a clock and additional RAM. I like the idea because you can add the options you want or need without using additional expansion slots.

When you use this as a mono card, you start out after every boot with a scrambled screen until you run some software to reinstall it. That can be incorporated in an AUTOEXEC.BAT file to bring it up and running automatically every time you boot. But the first card I had defied every effort, including a couple of phone conversations with technical types at Paradise, and never did give me a usable monochrome screen.

A replacement was quickly sent to me, and it wouldn't come up as a mono card either. While I had no other monitor card in the system at the time, I did have a couple of other cards in the box that shouldn't have had any effect on it. But on the off chance that there was some interference, I stripped the box down to nothing but the system board, the disk controller, and the Paradise board. Suddenly the Modular Graphics Card worked perfectly.

The question then was which of my other boards was the culprit. So I put them back, one at a time, waiting for one to crash the Paradise board. None did. I tried the Paradise board in each of the expansion slots and it worked; before, neither it nor its predecessor had worked in any slot. I tried to get the original board back for another try, but it had already been returned. And I have not been able to duplicate the problem again.

Without a Clue

The manual cautions against trying to use the Paradise Modular Graphics Card as a monochrome card with any color/graphics card in the system. But it doesn't rule out using it as a color/graphics card with some other card managing a monochrome display. It can be done, I found, without any clues from the documentation, by setting the system board switches the way you would for any dual-monitor combination. Still, the fact that this Para-

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VIDEO BOARDS

disse board can do monochrome only as a solo is a distinct drawback.

Nor was I pleased by its performance as a mono board teamed up with an IBM green screen for text work. It didn't like my favorite word processing software and did strange things with the cursor. With other boards, the word processor changes the cursor in distinctive ways to signal if the NumLock or CapsLock is on and which text entry mode I've set with the Scroll Lock. The only distinctive thing the Modular Graphics Card did to the cursor was hide it if I accidentally hit the NumLock. Of course, that's only one applications package; the card seemed to work just fine with others I tried.

While most of the character set the Modular Graphics Card produces is pretty standard and easy to read for text work, there are some peculiarities. The most obvious is the middle leg of the lowercase *m*, which is slimmer down to a single row of dots. This is a result of Paradise's choosing to use a narrower dot matrix (8 x 14 rather than 9 x 14) for the character set. Overall, the new Paradise Modular Graphics Card gets a mixed review.—J.F.

PARADISE MULTI DISPLAY CARD

The Paradise Multi Display Card is easy to love. It installs easily, with well-illustrated documentation that can guide a neophyte through the trauma of opening up his or her PC for the first time. There is one on-board jumper block and a block of DIP switches, but both are big enough to be obvious and easily identified right up at the top of the daughterboard that completely overlays the main card.

You can't really go wrong without trying, and once you plug in your monitor(s) and boot the system, you're up and run-

If you're on a limited budget, the Multi Display Card is a good choice as your first monitor card.

ning. There's no limbo time while it waits for software installation. You will have to do some programming before you can access all the features this board supports. But you can do a lot of work without having to give software a second thought.

As a monochrome board, the Multi Display Card puts out a very nice, quite IBM-like character set that's easy on the eyes and easy to work with for long periods on an IBM green screen. It doesn't do characters any better than anyone else's board, but just-as-good suits me fine.

And while not a thing of beauty, a full, 80-character line mode called up on a decent color monitor yields text that isn't at all bad. Although obviously no match for a high-resolution mono screen, it's about on par with the competition.

The Multi Display Card really shines when it's doing what it was designed to do: handling both a monochrome and a color or composite monitor while taking up just one of your precious expansion slots. If you're just starting out and configuring a system on a limited but not stingy budget, this card is a good choice as your first monitor card instead of either of the possible genuine IBM alternatives.

A Switch Hitter

It can operate only one monitor at a time, and so if you need both displays simultaneously for any reason, you'll still have to buy a second card. But for many applications, a single Multi Display Card should suffice even when you do add that second monitor. It can automatically switch back and forth between mono and color monitors to give you access to all the

features of software like Lotus's 1-2-3. Or you can switch back and forth between the two from the keyboard. With recent DOS releases—2.0 and later—you can do it with a MODE command. However, the manual provides listings for short programs that will accomplish the same thing; you can set them up so that a single key-stroke will make the switch.

If you choose to put a second monitor card in your system, the Multi Display Card is nice because it can assume the King Color role alongside someone else's mono board or play second fiddle to another color/graphics card.

Seconds Count

Unlike running with two monitor cards—where software switching times between mono and color are barely noticeable—there's a significant time lag with the Multi Display Card. It's especially apparent when going from color to mono; 3 seconds elapse before there's a usable screen image. Going from mono to color, the time is reduced to about 1 second, which I could certainly live with.

My only complaints are that I wish Paradise had made the parallel printer port optional and put a plug-on connector on the ribbon wire rather than soldering it to the board. Despite those minor gripes, the Paradise Multi Display Card is at the top of my list of choices.—J.F.

PERSYST BOB COLOR ADAPTER

BoB stands for "Best of Both." Persyst's claim that the BoB board provides the best of monochrome and color graphics display on one monitor. As we shall see, the BoB board does offer a measure of both video disciplines, but with some trade-offs, as might be expected.

The BoB board itself is a full-length,

single card that you plug in to install. The only jumpers on the board control whether the flicker intrinsic to IBM color mode will be displayed or disabled (at the possible price of sacrificing compatibility with some color software).

Limiting the Field

The main restriction in using the BoB is the monitor required. A high-scan-rate monitor with a scan rate of 24.83 KHz +/- 500 Hz must be used; the Princeton Graphics SR-12, with its 31-KHz scan rate, is not acceptable. Persyst recommends either the NEC JC-1410 or the Taxan 440. You can use a composite monitor, but much of the board's advantage would be lost.

Various options are available for the BoB, including a downloadable RAM character set, a ROM-based secondary character set, and an extended-graphics memory module, which allows 320 x 400 and 640 x 400 resolution. The sample board had only the secondary ROM character set, and so all tests were conducted in normal 200-pixel line modes.

When a system with the BoB/Taxan combination is started, it is immediately obvious that something unusual is afoot. The resolution of DOS's sign-on is excellent—definitely in the same league as a normal monochrome monitor. Persyst uses an 8-by-11-dot character in a 10 x 16 grid, which actually is denser than the character matrix used in IBM monochrome. The elegant, highly readable font is Persyst's own creation.

Even a very good color monitor like the Taxan is not as critically sharp as a monochrome monitor, and the specter of convergence always lurks in the background, but the display on the test system was just great. Some flicker appears during scrolling, as Persyst says, but it is less than a normal IBM color card, and it can be eliminated through the jumper setting. Overall, there's no question that the system could be used for continuous text processing. A few other boards reviewed in this series offer this kind of text performance on a

color screen, but the BoB's display is the equal of them at lower cost. Obviously, there's no comparison with a standard IBM-type color adapter.

Passing with Flying Colors

All the color programs I threw at the BoB worked normally, including Lotus's 1-2-3 and COLORBAR.BAS. There's a slight but perceptible flicker when large areas of the screen display light colors. I didn't notice this effect when using the Princeton Graphics SR-12 with review boards that can drive that monitor. It is possible the somewhat lower scan rate of the Taxan causes this, but, in any event, it

The performance of the BoB board was excellent. The only reservation I have is the need for a Taxan or an NEC monitor.

is rarely noticeable and not a major problem even then.

I could not test the 400-line modes without the optional memory upgrade, nor could I try the downloadable RAM character option. The RAM option is supplied with a utility that allows the user to design customized character fonts for the BoB and the Epson FX series of printers. It sounds like fun.

The performance of the BoB board was excellent. My only reservation is the need for a Taxan or NEC monitor. While the sample Taxan was fine and NEC makes very good monitors as well, it would be nice to have a wider choice. In general, the BoB card is a very nice product. It doesn't need special software to run normal color graphics programs, and it provides terrific text quality on one monitor—just as Persyst claims.—G.A.H.

PROFIT SYSTEMS MULTIGRAPH

The Profit Systems Multigraph is a video card designed to offer standard IBM-compatible monochrome and color and high-resolution monochrome graphics. It's a full-length, single board of good construction.

Installing the Multigraph requires only that the user decide how to configure the board. If a monochrome monitor will be used, one setting configures the board for either standard monochrome or high-resolution monochrome graphics mode akin to Hercules graphics, while another choice sets the board to a mode that displays color-mode graphics on the mono monitor. A different setting is used if the board will drive a color monitor. One eight-position switch is used to make the settings.

The Multigraph has only one video connector, which is used for whichever monitor the user has; you cannot connect two monitors simultaneously. Profit Systems takes great pains to point out that a monochrome monitor can be trashed if the switch settings are incorrect. This is a problem with many dual-purpose adapters with only one video connector, but it certainly would not give a beginner overwhelming confidence. The card will work with another display board in the system, which can be either a color or mono card; the Multigraph assumes the role not filled by the other video adapter.

High-Res Anxiety

Switching between normal IBM 80 x 25 mode and what Profit Systems calls Monochrome Graphics One mode (90 characters by 40 lines) is done with the MGMODE command. (This works only if the MGMONO command has been issued; MGMONO does not have any other effect, and so it would normally be put in

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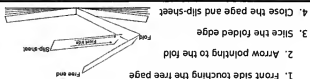
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Kids on Keys (ages 3 to 9)	23
Story Machine (ages 5 to 9)	23
Fraction Fever (ages 7 to adult)	23
Kinder Comp (ages 3 to 8)	20
Rhymes and Riddles (ages 5 to 9)	20
Hey Diddle Diddle (ages 3 to 10)	20
Alphabet Zoo (ages 3 to 8)	20
Stone (requires graphics board)	
My Letters, Numbers, Words (ages 1 to 5)	29
Kids Stuff (ages 3 to 8)	29
Across the U.S.A. (ages 5 and up)	22

GAMES

Blue Chip	
Millionaire	39
Tycoon	39
Beron	39
Broderbund	
Lode Runner	25
CBS Software	
Match Wits	21
Murder by the Dozen	23
FriendlySoft	
FriendlyWare/PC Arcade	35
Furthest	
Snack Attack II (a favorite)	27
Cosmic Crusader (as good as above)	27
Big Top (climb to new levels)	29
Mester Miner (1 or 2 players)	29
Hayden Software	
Sargon III	35
Infocom Difficulty levels shown in <i>italics</i>	
Seastalker (junior)	25
Zork I (standard)	25
Enchanter (standard)	25
The Witness (standard)	25
Planetfall (standard)	25
Cuthroat (standard)	25
Zork II (advanced)	29
Zork III (advanced)	29
Infidel (advanced)	29
Sorcerer (advanced)	29
Deadline (expert)	33
Starcross (expert)	33
Suspended (expert)	33
<i>Invisclues (hint booklets) are available for all Infocom games. Specify game</i>	<i>7</i>
Microsoft	
Flight Simulator	35
Origin Systems	
Ultima III	39

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GATO	27.
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Sublogic	
Night Mission Pinball	29

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System Stand	21

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VIDEO BOARDS

the system's AUTOEXEC.BAT file so that it will be loaded automatically at start-up.) In the MGI Mode, DOS has been patched to allow the full 90 × 40 display. Since this is a graphics mode, the standard IBM monochrome character font is not used; a font halfway between mono- and color-font quality is displayed instead. Scrolling is much like the IBM color card's; there is a disconcerting "ripple" effect. It's also unsettling to see the cursor disappear. This mode doesn't work with BASICA; the screen fills with vertical lines and other strange things happen.

A significant part of the documentation is devoted to installing special Profit Systems drivers for Lotus's 1-2-3 with the various possible configurations. The reason for this is that the Multigraph high-resolution monochrome graphics are similar to Hercules graphics in concept only. While the resolution is identical, the Profit Systems board is not compatible with the Hercules. Thus special drivers specific to the software must be used to correct for the inconsistencies between the Multigraph and the Hercules. Software designed for the Hercules will not work with the Multigraph any other way (I verified this finding with several Hercules-compatible programs).

Unfortunately, I could not get 1-2-3 to work with the Profit Systems drivers. The system simply hung up after 1-2-3 loaded, displaying absolutely nothing on the screen.

Hercules Yardstick

This problem could have been unique to my version of 1-2-3 (although I have the standard current release), but I think it illustrates a basic weakness in the Profit Systems design concept. Why come close to Hercules compatibility, with the same resolution and performance, and yet be incompatible? Even if the 1-2-3 drivers supplied had worked, what about the other Hercules-compatible programs appearing in increasing numbers? In any event, I was not able to test the high-resolution monochrome performance of the Multigraph.

As a color card, the Multigraph worked well and drove my Princeton Graphics Systems RGB monitor with no problems. Profit Systems supplies a DOS patching program, which eliminates the annoying flicker of an IBM color card and also writes to the screen significantly faster than without the patch. An 80-column by 40-line mode is available as well.

A parallel port is available as an option. It was not supplied with my test sample, so I can't comment on its performance. A nice feature is that the address of the port is fully changeable to any legal designation. Other options advertised by Profit Systems include enhanced color (up to 600 by 400 pixels with 16 colors), 132-column by 40-line monochrome, 720- by 700-pixel monochrome, and smooth scrolling, but none of these was supplied for review.

My overall reaction to the Multigraph is negative. I don't buy the design concept, and the drivers for 1-2-3 simply didn't work. Other products reviewed in this series do more and work correctly while offering full compatibility with Hercules-style monochrome graphics.—G.A.H.

QUADRAM QUADCOLOR I

The Quadcolor I is a straightforward color display adapter akin to the IBM color adapter card. It is manufactured by Quadram, a highly regarded producer of multifunction IBM-compatible boards, monitors, and other peripheral devices.

The Quadcolor I performs all the functions of a normal IBM color card and has a few rather minor enhancements as well. For example, the board has 32K of display memory rather than the 16K standard on an IBM card. This could be useful for simple animation techniques, but since the second 16K memory bank is not accessible from IBM BASIC, most users will

never use the extra capacity.

Another nicety is the ability to display any two of the 16 IBM colors—rather than only black and white—in high-resolution, 600- by 200-pixel mode. Connectors for a light-pen and RF modulator are provided, and there are also provisions for the Quadcolor II enhancement board (reviewed in this series).

Portless

On the other hand, the Quadcolor I does not include some of the features reasonably common on third-party color adapter boards. There is no parallel printer port (the IBM color card doesn't have one either), and only the normal double-dot color text font can be displayed.

There are no jumpers or switches to set on the board before merely plugging it in. The Quadcolor I is a full-length, single board of good construction.

Quadram makes quite a point of mentioning that its design eliminates the glitches that can result because of contention between the 6845 CRT controller and the PC's 8088 CPU. Writing to the screen is somewhat faster than a regular IBM color card, as well. However, there is flicker when a text screen scrolls. It is not quite as bad as with some competing color adapters or the IBM original, but it is annoying nonetheless.

Writing Awards

The Quadram documentation deserves special mention. It is well written, illustrated, and produced while being complete and detailed, and yet not stuffy. The manual has a professional feeling, which reflects well on the product as a whole. This documentation should be a model for other video board manufacturers.

The Quadcolor I works quite well, other than the moderate flicker. It holds no surprises but no real advantages either. Choosing the two colors to be displayed in high-resolution mode is a minor advantage and works as advertised. The Quadcolor I is not particularly exciting, but it is competent.—G.A.H.

QUADRAM QUADCOLOR II

The Quadcolor II is an enhancement piggyback board for the Quadcolor I adapter (see Quadcolor I review in this series) that adds extended color capabilities. The primary advantages offered by the upgrade are the ability to put 136 different colors on the screen simultaneously in 320- by 200-pixel, medium-resolution mode and 16 different colors at once in high-resolution, 640 x 200 mode. An IBM-compatible game port is also included.

The Quadcolor II plugs into a Quadcolor I through two banks of connectors. This process is easy, as is installation into a PC. There are no mysterious jumpers or switches to set.

The board operates as a standard color adapter, and the system comes up in normal color with no surprises. To use the extended color modes, you must run an initialization program. Quadram includes a simple installation program that automatically adds the appropriate command to an existing AUTOEXEC.BAT file or creates the AUTOEXEC if needed.

BASIC Patchwork

The installation program can also create a patched version of normal BASIC, which extends BASIC to allow access to the special color features offered by the Quadcolor II. The modified BASIC includes two new screen modes for the 136-color, medium-resolution and 16-color, high-resolution modes. It also provides SCREEN TO and SCREEN ON/OFF commands, which allow switching between Quadcolor screen modes and toggling of the Quadcolor I and II modes on and off. Various other BASICA commands are also modified in the BASICQ version to allow the normal BASIC commands to use the Quadcolor II features.

My sample Quadcolor II worked exactly the same as a Quadcolor I in normal

operation. Writing to the screen was fast, but flicker showed up during scrolling, albeit less than that exhibited by IBM's own color adapter.

Unfortunately, Quadram's patch to BASICA simply didn't work. The installation/patching process went smoothly, but every time I tried to load the modified BASICQ, the drive light stayed on and nothing happened on the screen. The system also would not respond to a keyboard reboot, and so power had to be cycled off and on. I tried the installation process and executing BASICQ on three different PC systems with an equal lack of success.

Version Diversion

A call to Quadram's support department revealed that the BASICQ patching process works well with the BASIC sup-

Quadram is prominent enough that the Quadcolor II should appear on the menus of popular color graphics programs.

plied with DOS 2.0 but doesn't work with the DOS 2.1 BASIC. Evidently IBM changed the internal design of 2.1 BASIC to accommodate the PCjr, and the changes were enough to throw the Quadram patch off. Reinstalling BASICQ with DOS 2.0 BASIC worked on the first try.

The extra screen modes and command enhancements provided by BASICQ all worked nicely. The 136-color, medium-resolution mode was truly lovely. All 136 colors can be displayed simultaneously; no palette groupings or other artificial barriers stand in the way of full use of the available spectrum. The 16-color, high-resolution mode also worked fine.

The Quadcolor II is an attractive package. Quadram is prominent enough that the Quadcolor II should appear on the menus of popular color graphics programs; so the extended color modes should be available in commercial software as well as usable in programs written by the user. The 136-color, medium-resolution mode is especially appealing, and the board is reasonably priced.—G.A.H.

SIGMA COLOR-400 COLOR ADAPTER

A new generation of RGB color monitors has appeared in recent months. The new monitors use a horizontal scan rate much higher than that of a standard IBM-type color monitor (usually in the range of 25 to 32 kHz or so) and display interlaced video rather than the noninterlaced video standard in IBM-type RGB monitors. Noninterlaced video displays each line of the video image twice to reduce flicker, as is done in broadcast video. This works well, but sacrifices resolution. Interlaced video displays a separate and distinct line for every line available on the screen, effectively doubling resolution. Interlaced video is a more critical mode, and component design and manufacturing tolerances must be superior. High-scan-rate monitors, therefore, cost more than regular RGB monitors, but the cost increment is not terribly great at IBM-type resolution. (Monitors with much higher resolution, usually with screen phosphors with longer persistence to reduce flicker but with less brightness, cost quite a bit more.)

The new breed of monitors, typified by the Princeton Graphics Systems SR-12 and similar units from Electrohome, Hitachi, and others, require special video adapter boards to drive them. Their crystal

VIDEO BOARDS

oscillators must operate at higher frequencies (typically 24 MHz), their memory speed may have to be faster, and their board software or firmware may require modification as well.

The Color-400 from Sigma Designs is an IBM-compatible color video adapter that is designed to drive the PGS SR-12 and equivalent monitors. If specially prepared software is used, full 640- by 400-pixel resolution in noninterlaced mode can be used for detailed graphics.

Making the Mundane Magnificent

Since little such software exists yet, a board like the Color-400 would not be terribly significant were it not for its most interesting aspect: normal IBM color programs can be displayed on a 400-line, high-scan-rate monitor. The Color-400 automatically creates a double of each program-generated line and displays it on the adjacent line, essentially creating a 400-line version.

While this doesn't sound like it would produce a major change in the appearance of the screen, in reality it does. Character and graphics shapes have a much more "filled-in" quality. They look continuous rather than "dotty." The overall effect is pleasing and quite a bit easier to work with than a normal color card driving a standard RGB monitor.

The sample Color-400 provided for evaluation was a pre-release prototype and had quite a few hand-wired patches. There are no jumpers on the board to set before merely plugging it in. A short program placed in the AUTOEXEC.BAT startup file is required for the demo board, but when the final version is released, Sigma will fill an empty ROM socket with a chip that will make the Color-400 run like any other color adapter.

Other than the 400-line conversion capability, in many respects the Color-400 runs very much like any other standard IBM-compatible color adapter. On the prototype, the single-dot character font is used instead of the clumsier double-dot font, and the single-dot font looks even

better than usual with the continuous appearance of the 400-line display. Sigma tells me the ROM production model will use the same very high-resolution character font as the company's Graphics Dazzler boards. As I commented in the reviews of those boards, the text display approaches monochrome quality. Adding to the excellence of the display is the total absence of flicker during scrolling. So at long last, there's a color display I'd be willing to write on all day.

I tested the Color-400 with several programs configured for a normal IBM color display. Lotus's 1-2-3 worked perfectly, with its graphs displayed in vivid red, blue, and green rather than the normal, pallid palette. *WordStar*, in color, benefited from the better-looking characters, and other graphics programs looked just as good. Running *COLORBAR.BAS* revealed an oddity: all the color bars had the same intensity, and accordingly, the "gray" bar didn't display at all. Obviously, the intensity control was not working on the sample board. This is an artifact of the prototype that Sigma says will be corrected in the released version.

Broad Strokes

Sigma provided a sample of a new program called *PC Paintbrush* from IMSI to help evaluate the board. *PC Paintbrush* is, to put it politely, inspired by *MacPaint* on the Apple Macintosh. The major difference is color. While the program supports several different color boards, including Tecmar, Seicon, Quadcolor, and Amdek, there currently is no special version for the Color-400. But the Sigma board did an excellent job with it configured for a normal IBM color display.

A special version of *PC Paintbrush* is being prepared that will use the full 400-line display capacity of the Color-400. Sigma plans to bundle the 400-line *PC Paintbrush* with a Mouse Systems optical mouse for only \$100 more. This package represents quite a bargain, given the price of the *PC Paintbrush* software and the mouse.

The Color-400 is not inexpensive, and the added cost of a high-scan-rate monitor must be considered in determining whether the improved performance is worth the price. There is no question that software that uses the full 400-line resolution capability is terrific. Software using 200 lines also looks a lot better, and the Dazzler high-resolution text font is wonderful. The user also gets a color board that's standard in other respects (there are no parallel port, added colors at high resolution, compatibility with Plantronics, or other advanced color features), albeit a color board that performs well. As more 400-line software is released, the Color-400 will look better and better. In the meantime, each potential purchaser must decide based on how critical his or her color display needs are. The Color-400 definitely improves any color program, and for users to whom the added cost is not a major stumbling block, I recommend it highly.—G.A.H.

GRAPHIC DAZZLER I AND GRAPHIC ENHANCER

The Sigma Designs's Graphic Dazzler I is a specialized, high-resolution, color video card capable of performance beyond that of most boards reviewed in this series. Unlike some other supercolor cards, it can be used with standard IBM-type RGB color monitors, although its performance is even better with special monitors that have high scan rates, like the Princeton Graphics SR-12.

Sigma states flat out that the Dazzler I is not intended to replace a standard monochrome or color card as a general-purpose

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VIDEO BOARDS

display card. It is compatible with software that writes to the screen through the IBM BIOS routines, but since so many programs circumvent the BIOS and write directly to the video hardware for increased speed, the Graphic Dazzler I won't work with much available software.

What the board is, on the other hand, is a very advanced high-resolution graphics device with unprecedented video memory. The NEC 7220 graphic display controller is used to generate the video, rather than the prosaic Motorola 6845 used on most IBM-compatible video cards. It is a truism that dedicated hardware can be much faster than software performing the same functions, and the 7220 has hardware logic to perform such functions as panning, zooming, line and arc drawing, and area filling at extremely high speed.

Memory Mass

A "basic" Graphic Dazzler I has 256K of display memory, and the optional Graphics Enhancer plug-in adds another 256K for a total of 512K! All this memory is used to create a video memory of 1,024 by 1,024 by 2 bits on the base board and 1,024 by 1,024 by 4 bits on the expanded card. The display area can be panned over the entire 1,024 × 1,024 memory area. A 4-bit by 4-bit color map is used to display 16 colors without modification of the display memory. DMA (direct memory access) is provided by Sigma for high-speed memory transfers.

The Dazzler I operates in 640 × 200-pixel mode on normal IBM RGB monitors and equivalents like the Princeton Graphics HX-12. If a color monitor with a horizontal scan rate of at least 25K, like the PGS SR-12, is available, a 24-MHz crystal can be inserted into the Dazzler I and the system can then display 640 × 400 resolution.

The Graphic Dazzler I can serve as the sole color card in a system, with the compatibility limitations mentioned above, or happily coexist with other monochrome or color adapters. Sigma provides switching

software to move from monitor to monitor if necessary.

Installing the Graphic Dazzler I involves only plugging in the card. While there are jumpers on the board, no user adjustment is needed. The card is driven

The Graphic Dazzler I is a very advanced high-resolution graphics device with unprecedented video memory.

by software dependent on the version of DOS being used and whether there is another monitor and display card in the system. Software is provided for DOS 1.x and DOS 2.x, with the 2.x version using CONFIG.SYS to insert a driver into DOS. There is also a freestanding initialization program, which can be inserted into AUTOEXEC.BAT to bring the system up, and both methods are easy to install.

Shown on a PGS HX-12, the display was crisp and steady. The font is not the standard double-dot IBM style; a single-dot font similar to that available with a Plantronics board is used instead. The font is sharp, but a few of the characters, like the lowercase *m*, are a bit hard to read.

Sigma supplied two ways to check the board's performance. The demo program is an absolute knockout. While there are other products that can display 16 colors simultaneously, the real difference with the Dazzler I is speed. Writing, panning, and scrolling are lightning fast. Even smooth scrolling is possible, with a smoothness and ease not often matched even in monochrome.

Sigma also supplied a copy of Personal CAD Systems's *PCAD* computer-aided-design program for the review, since this program supports at least some of the Daz-

zler I's features. The program worked well but had some limitations, not using all the advanced video capabilities available from the enhanced Graphic Dazzler I. *AutoCad*, a fine, competing CAD program, evidently also supports the Dazzler I, but the appropriate driver was not available for testing.

Not for the Timid

The excellent documentation includes detailed instructions on how to create software for the Graphic Dazzler I. Sigma provides an object file that can be linked with user-created software to ease the development process. Suffice it to say that programming the Dazzler I is not a task for novices who think the graphics commands in IBM BASIC are complicated. Commercial software houses shouldn't have any major problem, though.

I also tried the Dazzler I with a high-scan-rate Princeton Graphics SR-12 after inserting the 24-MHz crystal into the Dazzler I. The board came up instantly with no problems. Absolutely no flicker or other on-screen glitches appeared. The special character font has much better resolution than normal color characters and approaches the clarity and readability of monochrome characters. The Sigma demo program ran even better on the SR-12, with vivid colors, excellent resolution, and extremely fast operation.

Unlike normal color text displays, which are unpleasant to look at right away and become tiresome and unacceptable after a period, the Dazzler I/SR-12 combination would be perfectly acceptable for continued heavy use. This is the first affordable color display I would characterize this way.

The Graphic Dazzler I is clearly designed for CAD and similar advanced applications. While it is obviously a specialized product, its cost is quite reasonable compared to alternatives using similar advanced hardware (the Vectrix system, for example). Using such high-powered hardware sort of ruins one for the run-of-the-mill PC color card. It's unrealistic to

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hope that a wide spectrum of general software will appear for a board like this, but if I could wave the proverbial magic wand, that's what I'd want. The performance of the Graphic Dazzler I is simply in a class apart if software appropriate to your needs is available.—G.A.H.

GRAPHIC DAZZLER II

The Graphic Dazzler II is a slightly simplified version of the excellent Graphic Dazzler I reviewed in this series. In many ways, it meets an ideal definition of a "baby brother" product: it provides essentially all the functionality of its senior model with only minor sacrifices, takes up less room, has fewer chips for enhanced reliability, and, perhaps most importantly, costs significantly less.

Inexpensive Specialist

Like the Graphic Dazzler I, the Dazzler II is a specialized, high-performance color adapter card that is not designed to supplant a standard color or monochrome adapter (although it can serve as the only display card in a system dedicated to high-resolution color graphics). It is designed for CAD, animation, and other serious graphics applications and includes high-speed hardware graphics in the form of the powerful NEC 7220 graphic display controller and appropriate support hardware.

The only important attribute Dazzler II sacrifices is display memory: it has less than the Dazzler I. The Dazzler II has 640-by-400-by-4-bit memory, whereas the Dazzler I has a 1,024-by-1,024-by-2-bit memory (4-bit when equipped with the optional Graphics Enhancer). Since the Dazzler II display memory is sufficient to manage an entire IBM PC screen, little is lost other than high-speed panning through the extended memory on the more expen-

sive board.

The Dazzler II installs in the same manner as the Dazzler I. The only jumper that you may have to set is one indicating whether 200-line interlaced or 400-line noninterlaced mode will be used. Other than that, you just plug it in, set up either a CONFIG.SYS or AUTOEXEC.BAT file with the appropriate Sigma driver to match the version of DOS being used, and then, away you go.

The Same for Less

I tested the Graphic Dazzler II with a high-scan-rate Princeton Graphics Systems SR-12 in 400-line noninterlaced mode and all went as I expected. To my eyes, the Dazzler II duplicated exactly the incredible speed and resolution of the Dazzler I. Performance was, in a word, dazzling.

The Dazzler II costs \$995, while the basic Dazzler I is \$895 and the enhanced Dazzler I is \$1,590. Thus the Dazzler II offers essentially the same performance in terms of 16 colors on the screen, fast hardware panning, zooming, line and arc drawing, and so, for quite a significant saving. This excellent product is highly desirable if available software customized for the card meets your requirements.

—G.A.H.

STB GRAPHIX PLUS II

The Graphix Plus II from STB Inc. is a video adapter card that can drive both monochrome and color monitors. In addition to IBM compatibility with both types of monitors, the Graphix Plus II offers high-resolution monochrome graphics and enhanced color modes.

One eight-position switch must be set before installation. The documentation is

clear on the settings required for mono-only, color-only, and dual-monitor systems. The board has two nine-pin connectors, one for each type of monitor, and a composite monochrome RCA jack (the Graphix Plus II doesn't support composite color monitors).

Once the card is installed, operation is simple. No special commands are needed to switch between the color and the monochrome monitor. The regular DOS MODE command switches you back and forth very easily. The monitor not in use is automatically disabled, so there is no problem in leaving both monitors connected. Like many similar dual-purpose video adapters, the Graphix Plus II has only one CRT controller chip, and so it's impossible to display material generated by the STB on both monitors simultaneously. But you can use the card with another video card in the system for those situations in which you require simultaneous display.

By the Displayful

The Graphix Plus II has a monochrome graphics mode with 640-by-350-pixel resolution, using the full display area of an IBM-type monochrome monitor. This resolution is somewhat less than that of the Hercules, but the difference isn't terribly noticeable on screen. Obviously, STB mono graphics are not compatible with those of the Hercules, and so you can't use any of the Hercules-compatible software on the market. An 80-character-by-44-line monochrome text mode is also provided, and true gray scales can be generated on the mono screen.

Enhanced color is also available. The STB can display four colors at maximum 640-by-200 resolution, as compared with the standard black and white produced by a normal IBM color card of that resolution. And it can display 16 colors at medium resolution of 320 by 200.

Perfect Emulation

Operation in normal monochrome and color modes emulated the standard IBM functions perfectly. There was absolutely



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no flicker, and writing speed was fast in either mode. The DOS MODE switched between monitors as claimed.

STB provides three special drivers for Lotus's 1-2-3 to implement full-screen high-resolution monochrome graphics, 16-color medium-resolution graphics, and 4-color high-resolution graphics. All worked correctly and produced impressive results. Monochrome graphs were produced with excellent speed and resolution, and the two color modes generated lovely 1-2-3 graphs. The medium-resolution 16-color mode was especially appealing.

A parallel printer port is standard equipment on the Graphix Plus II. A ribbon cable and rear panel connector are supplied, and the port worked as I expected. The port address cannot be changed—a minor inconvenience. An optional clock/calendar with battery backup can be installed easily, but STB did not provide one with my sample.

Warm and Safe

STB also includes a copy of its excellent *PC Accelerator* software. Basically a RAM disk and print spooler program, *PC Accelerator* has many unique features that make it one of the most desirable programs of its type. With it, for example, you can warm-boot the PC without losing the contents of a RAMdisk! *PC Accelerator* is best used with STB's own memory boards, but many of its features work quite well with my AST MegaPlus multifunction card as well.

The STB Graphix Plus II is easy to install and use, works well, and is reasonably priced. I wish the monochrome graphics were compatible with Hercules; the manufacturers of several of the boards examined in this project seem to think the only program in the world is 1-2-3. The same goes for the enhanced color options, which would be more useful if they were compatible with Plantronics protocols. Nevertheless, the Graphix Plus II is a trouble-free, well-designed, and well-executed adapter card that deserves careful consideration.—G.A.H.

C.C.S. SUPERVISION

SuperVision is a very flexible monochrome video adapter produced by California Computer Systems. It offers a choice of various text configurations as well as two high-resolution graphics modes; one is compatible with the popular Hercules protocols, and the other emulates IBM color to be displayed on the monochrome monitor.

Installation is straightforward, requiring only that you set two switches to indicate whether the SuperVision should respond to information directed to the memory area reserved for monochrome, color, or both. Set Switch 1 on the PC motherboard to match and off you go. A serious glitch is that the preliminary manual gives incorrect switch-setting information. A text file on the software disk supplied with the unit had the correct settings, but it took some digging to unravel the mixup. The error has evidently been corrected in a new manual to be released as this is being written.

Misprints

Four distinct text display modes are available. In addition to standard 80-by-25, the SuperVision can also display 80 characters by 44 lines, 132 by 44, and 132 by 28. The 80-by-44 mode is excellent for word processing, while both 132-column modes are good for spreadsheets and word processing tables. CCS's literature mentions DEC VT and IBM 3278-05 compatibility, but this is misleading. The SuperVision does not emulate either terminal; it merely provides the 132-column hardware environment necessary for some software package (not supplied by CCS) to do the emulation. The literature also says that a full-screen editor that can use the 132-column modes is provided, but CCS no longer includes the editing program.

An optional graphics adapter allows

graphics display to emulate the Hercules monochrome graphics card. There is also a graphics mode which is a *partial* emulation of IBM color graphics displayed on the monochrome monitor. Many programs designed to use the IBM color mode will run on the SuperVision, but many others will not. Programs that have been modified to generate Hercules mono graphics all work correctly.

The rear of the board has the nine-pin connector for the monochrome monitor (you cannot connect the SuperVision to a color monitor) and a standard 25-pin connector for the parallel printer port, included as standard equipment.

Two initialization files are provided to insert into the user's AUTOEXEC.BAT file. One sets the board for the various text options, and the other allows graphics operation.

Switching among text modes is done with programs supplied by CCS. MODE8044 switches to 80-by-44 text, MODE132 changes to 132-column-by-44-line display, etc. Here another documentation error occurs: the 132-by-28 program is called M13228.COM in the manual, but the actual program is named M132BY28.COM.

Performance in all the text modes is excellent. Each of the four possible modes has its own font, with the normal 80-by-25 mode using the standard IBM monochrome font. The 132-by-44 font is essentially the same as those used by the other boards reviewed in this project that offer that mode, but the 80-by-44 and 132-by-28 fonts are unique. Both are very readable and would be usable over long periods of time. CCS claims that the SuperVision design does not produce any screen glitches during updating, and my tests confirmed this claim. Writing to the screen is fast and clean in any text mode, with no snow or rippling during scrolling.

Application-Friendly

The Hercules graphics mode worked perfectly with 1-2-3, AutoCad, and Micro-soft Word. CCS provides special drivers

VIDEO BOARDS

for 1-2-3 graphics, which also worked immediately, but the graphs produced were not as detailed as with the Hercules mode. The optional graphics extender piggyback board is required for either graphics mode; so I see no reason to use anything but the Hercules mode, unless the software in use does not support Hercules graphics.

CCS also provides patching instructions for *WordStar 3.3*. You merely change the screen width and height locations within *WordStar* using the patching provisions hidden in the standard MicroPro WINSTALL program (DEBUG would also work fine). Patched *WordStar* worked well in all the text modes, with the 80-by-44 mode being particularly desirable.

Instructions and files to patch Micro-soft's *MultiPlan* spreadsheet were included. This process is far more complicated, but batch files on the disk automated the procedure nicely. Running a spreadsheet in 132-by-44 mode is truly useful. For example, a full year of monthly data can often be displayed as a unit. The SuperVision card worked smoothly with the patched *MultiPlan*.

CCS indicated patches for 132-column operation with 1-2-3 will be available by the time this article appears. The disk the company supplied also included sample BASIC programs you can incorporate into your own BASIC programs to change the display mode of the SuperVision. These worked as advertised and changed the size and font used, but IBM BASIC won't allow a display larger than 25 lines.

CCS claims that the SuperVision can coexist with a color board in the system. This is true only if the SuperVision is configured as a purely monochrome card. If you want graphic from it, you can't have a color card in the system; that's true with most Hercules-compatible cards.

Despite a few inconsistencies or errors in the manual (which was, after all, preliminary) and literature, the SuperVision works very well. It is one of the most desirable boards available for mono-

chrome use. Its four text modes are useful, especially with the patches provided by CCS for popular applications software. The Hercules graphics mode adds a powerful dimension to software designed for mono graphics. No other board offers the unique combination of attributes available with the SuperVision. CCS has produced a most attractive product.—G.A.H.

TECMAR GRAPHICS MASTER

The Graphics Master is an extremely versatile tool. But throughout the card's development, much of that versatility has been bought at the price of inconvenience. Under the Graphics Master's old software/documentation regime, the manual gives no fewer than 15 jumping configurations just to cover using the board with various monitors or in combination with other cards and monitors in multiple-display setups. That appears to have been simplified to some extent by new documentation and software, but the jumping is still something of a nuisance you have to learn to live with if you're going to use a Graphics Master.

Still, I can't be too critical of the required jumping, because it seems to play a key role in the Graphics Master's ability to take on so many different looks with different monitors and applications—sort of the Lon Chaney, Jr., of video boards. At least one key jumper has to be in a position different from the old configuration for the new software to even work with the Graphics Master board.

While the Graphics Master is still the same old board physically, with the new software it does behave in some very different ways. One of my biggest gripes with the Tecmar board had always been

that to switch from using a monochrome monitor to an RGB you had to open up the computer, remove the board for rejumping, and then put it all back together—a royal pain in the you-know-what.

Now, however, monitor changes can be done without rejumping, simply by switching the toggle on the bottom of the slot bracket. After typing in the software switching command, you have to unplug the monitor you had been using before you hit the enter key, so that while the switching is actually taking place, you momentarily have no monitor connected at all. But by the time you're ready to plug your other monitor in, the board's ready for it, so the switch is really quite painless.

As Close as Your Keyboard

The new Tecmar GMBIOS software brings a number of other options within easy reach, too, via simple keyboard commands. You can use it to change foreground/background color attributes while a program is running, shift the display around on the screen, and check or change various parameters.

Another nice feature of the new software is a screen-saver switch that automatically blanks the screen if you don't do anything with it for about 5 minutes. As soon as you hit any key, the display comes back up, and you're right where you left off.

The Graphics Master board has always had a 128K video buffer standard on the card, but with the new software, it's able to use it in some new ways. One of the more interesting of these is the ability to access up to 32 pages of monochrome text, 8 pages of four-color graphics, or some combination divided between monitors. And you can do this by means of a few simple keystrokes using the new GMBIOS software.

At the moment, that feature seems to be more of a teaser than something really useful, however. The problem now with the screens already sent to the buffer is that, while you can write to any of them on powerup, once you call up an applications

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VIDEO BOARDS

program, you can access them only to look at what they already contain. You can even print the contents of any or all of them using the `PrnSc` function. But as long as your applications package is in use back on page 1, you cannot write to any other page—at least not with the Tecmar software I had to work with. That precludes the animation effects you could create if it were possible to switch back and forth among pages, displaying one while writing another and then displaying the new written page.

The Tecmar Graphics Master is just a little ahead of its time, perhaps with features no one has applications for yet.

Off in the Future

A conversation with one of Tecmar's technical support people seemed to confirm that this feature is just a glimpse at a yet-unrealized potential. So once again, the Graphics Master is just a little ahead of its time, perhaps with features no one has applications for yet. It's a little like putting a mouse in your system before the applications people make special accommodations for it in their software.

The Graphics Master has always been one of the most versatile and most advanced but also most complicated video boards to work with. It is still one of the most versatile, perhaps now a little more so than ever. But Tecmar has made it a lot easier to work with, and that certainly makes it a more attractive choice than ever before. Even if it is still a little ahead of its time. —J.F.

TSENG ULTRAPAK BOARD

The largest sellers among IBM expansion boards are multifunction cards. These products usually focus on memory expansion, with a clock/calendar with battery backup and serial and/or parallel ports often included. Tseng Laboratories of Newtown, Pennsylvania, has designed a multifunction board that centers on video rather than on memory. The UltraPAK card replaces the IBM monochrome adapter, but it also provides expanded video functions, a clock/calendar, and I/O ports.

Only two jumpers need setting before installing the board. The first indicates if the optional second serial port hardware is present. The other enables both graphics pages available on the board if the UltraPAK is the only video board in the system. If a color board is also in the system, you must disable the second graphics page, since the color board uses this memory space.

This problem will sound familiar to owners of Hercules monochrome graphics boards, and indeed, the UltraPAK does feature Hercules-compatible graphics. As with a standard Hercules board, the UltraPAK cannot coexist with a color board on the same motherboard. Unlike the Hercules, the UltraPAK can display the output of most color programs on a monochrome monitor.

On the Big Screen

The UltraPAK's other claim to video fame is 132-column-by-44-line text. A program called `BIGSCR` seems to patch DOS to allow display of more than 25 lines at one time, a feat not matched by the Everex Graphics Edge 132-by-44 mode. Since `BIGSCR` has no effect on normal operations, it is easiest to include it in the `AUTOEXEC.BAT` file so it is invoked

when the system is started.

A clock/calendar is standard on the UltraPAK, as is a battery to keep the clock running when power to the PC is off. Tseng provides `SETCLOCK` to set the date and time and `RDCLOCK` to load the PC with the data. Putting `RDCLOCK` in `AUTOEXEC.BAT` will provide automatic time and data stamping without the user having to answer the `DATE` and `TIME` prompts usually displayed when DOS wakes up.

Tseng also supplies RAMdisk software to set up an area of memory as a disk emulator. Most such software is executed directly from DOS, with parameters specifying the size of the disk and other factors. The Tseng software, however, uses a device driver named `MEMDSK.DEV`, which is installed into DOS through `CONFIG.SYS`. A utility called `SZEMDSK` modifies `MEMDSK` so that it creates a RAMdisk of any size up to 360K. While the Tseng method works, it is more awkward and somewhat less flexible than the normal methods.

The UltraPAK features one serial port and one parallel port as standard equipment. A second serial port can be added. A small connector bracket similar to AST's `ConnectAll` is provided so that the connections at the rear of the PC can be neat.

Kudos and Oddities

The video performance of the UltraPAK is exemplary. The standard IBM text mode is as fast as with an IBM board, and Hercules graphics mode is fast and snow-free with 1-2-3, *AutoCad*, and *Microsoft Word*. The characters in 132-column mode are, of necessity, small, but they're easily readable. Tseng's patch to allow 44 lines of 132 characters from DOS is helpful, but it doesn't work with BASIC. Loading BASIC while in 132-column mode results in the common 25-line BASIC display, but in tiny, 132-column-mode characters. Even stranger, the cursor becomes a blinking underlined `u` with an unla. Odd, but of no impact whatsoever in normal operation.

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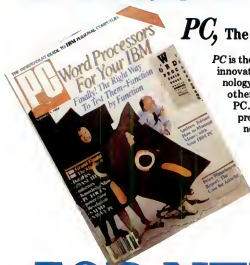
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VIDEO BOARDS

Tseng offers various piggyback boards that plug into the UltraPAK. The sample UltraPAK supplied by Tseng had a 384K memory expansion board plugged in, but the system would not boot with it in place. Since no documentation was provided for the memory expansion, I simply disconnected the piggyback for these tests. Other options include a floppy disk controller and a combination card that includes the floppy controller and up to 256K of RAM.

Overall, the UltraPAK proved to be a desirable product. Its video section worked beautifully, and the inclusion of a clock/battery and serial and parallel I/O on a video board is an interesting alternative to the common memory/clock/I/O multi-function board.—G.A.H.

APPLIED DATA VECTORSCAN 512

The VectorScan 512 is a high-resolution graphics controller. Unlike all the other products reviewed in this series, which are plug-in cards for the IBM Personal Computer and compatibles, the VectorScan is a freestanding device that you can use with any computer that has a serial port. It includes an 8085 8-bit microprocessor, graphics firmware, and the same Motorola 6845 CRT controller used on many PC display adapters. It takes its input from the host computer and displays the images it generates on a normal RGB monitor, composite color monitor, or monochrome monitor.

The VectorScan includes a standard Centronics-compatible parallel printer port and commands to use some of its 64K, 96K, or 128K display memory as a print queue. In addition, a connection for a serial terminal is provided. This last port

allows the VectorScan to be inserted between a computer and its terminal. In this case, special commands notify the VectorScan that graphics commands are

Two banks of jumpers on the internal VectorScan board determine the baud rate and data parameters.

being issued; otherwise, the terminal and computer communicate normally without noticing that the VectorScan is there.

Everything-Compatible

In a series devoted to evaluating PC video adapters, why are we looking at a device that isn't a PC plug-in video card? Two reasons. First, there's something to be said for a graphics machine that you can use with any computer. Many installations have some combination of older 8-bit computers, PCs, and/or larger computers. The VectorScan can be moved from one computer to another easily, and it is also easy to drive over a telephone line via a normal 300- or 1200-baud modem.

Second, Applied Data Systems, the manufacturer of the VectorScan, indicates that the single board in the VectorScan will be redesigned as a PC plug-in; the performance of the PC plug-in should mirror that of the freestanding VectorScan, except that the native PC version should run somewhat faster because data will be sent to it internally rather than over a relatively slow serial link.

Installing the VectorScan is prone to all the difficulties usually experienced in interfacing a serial device. Two banks of jumpers on the internal VectorScan board determine the baud-rate and data-word parameters that will be used. The host computer obviously has to use the same

settings. The DOS MODE command works well, and at least there is no idiosyncratic cabling requirement.

The VectorScan 512 display is 512 pixels wide by 480 pixels high. It's available in versions to display 4, 8, and 16 colors and gray scales from a palette of 16 colors (depending on whether 64K, 96K, or 128K of display memory is installed). The firmware supports drawing of points, lines, and circles and arcs; filling of specified areas or the entire screen; display of text either horizontally or vertically, and so on.

The VectorScan commands are normal ASCII text, which can be sent to the device interactively or from a BASIC or other high-level language program. The commands are three-letter codes followed by whatever parameters are necessary. For example, "CIR 100 100 20" draws a circle at location 100,100 with a radius of 20.

I tested the VectorScan with both an IBM PC and an IMS 8000 CP/M computer. The monitor I used was a Sony CPD. Interfacing was reasonably straightforward once the internal jumpers were set correctly. It would be more convenient, though, if Applied Data brought the jumpers out to two DIP switches on the back panel.

Line Try

The system came up immediately, with the VectorScan attempting to display a status line at the bottom of the screen and a graphics cross-hair cursor in the middle of the display. I say "attempted" because the status line was positioned slightly too low to be seen fully. Perhaps the 480 lines the VectorScan produces are simply too many for a normal RGB monitor designed for use with the PC display. I could not adjust the size of the Sony; so I tried a Princeton Graphics HX-12, with similar results.

The display produced by the VectorScan is impressive. Colors are deep and saturated, and resolution is good. Writing speed seemed quite fast in some cases, but less so in others (area fill of a large area

was sluggish, for example). A rather severe snow effect appeared when the screen was cleared, but not when images were being produced. The sample programs Applied Data provided me with produced detailed bar graphs, geometric patterns, scientific graphs, and other appealing displays. The code which produced the displays was long and required specifying various locations and vectors, but it didn't seem much worse than what might be required to produce the same results in BASICA. Programming complex graphics is no picnic in any language, and in some ways, the VectorScan method is clearer than the statements required in BASICA.

Creating detailed color graphics is far less common on S-100 and other CP/M machines, primarily because of the lack of hardware standardization. In this environment, the VectorScan is an attractive product. How the PC card version will stack up against the competition reviewed in this series is more difficult to assess.

In any event, the VectorScan is a good product that does what it claims. There's

Programming complex languages is no picnic, but in some ways the VectorScan method is clearer than the statements required in BASICA.

little likelihood that any commercial software will be produced for the VectorScan, but Applied Data Systems will create custom software on a paid basis. If you can write programs to meet your needs, or if you need graphics on a variety of machines, the VectorScan may be the answer. —G.A.H.

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San Jose, CA 95131
(408) 943-0596

List Price: \$249

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CIRCLE 679 ON READER SERVICE CARD

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Laurel, MD 20708
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VIDEO BOARDS

COLOR CHART

PHYSICAL CHARACTERISTICS

Manufacturer and Model	Length	Single/ Double	Plug-In Modules	Slots Occupied	Output Jacks M-Mono C-Color CP-Com- posite	Light Pen	Cost	Compatibility	
								Standard IBM	P-Plantronics L-Letec B-BASICA
Applied Data Systems, Inc. 9811 Mallard Dr. #213 Laurel, MD 20708 VectorScan 512	N/A	N/A	N/A	N/A	C, CP	No	\$975	No	No
Bronson Electronics Corp. 12700 Nicollet Burnsville, MN 55337 Innovation	Full	Single	No	1	C, CP	Yes	\$244	Yes	—
Discortex Corporation 87 Bethpage Rd. Hicksville, NY 11801 CX-1 Color Transformer	Short	Single	No	1	C, Analog	No	\$295	Yes	P,B
Emulex-PERSYST 3545 Harbor Blvd. Costa Mesa, CA 92626 BoB Board	Full	Single	Yes	1	C, CP	Yes	\$595	Yes	B
MA Systems, Inc. 2015 O'Toole Ave. San Jose, CA 95131 PC Peacock	Full	Double	No	1	C, CP	Yes	\$249	Yes	—
Quadram Corporation 4355 International Blvd. Norcross, GA 30093 Quadcolor I	Full	Single	Yes	1	C, CP	Yes	\$275	Yes	—
Quadram Corporation 4355 International Blvd. Norcross, GA 30093 Quadcolor II	Full	Double	Yes, Quad II is plug-in to Quad I	1	C, CP	Yes	\$569	Yes	B
Sigma Designs, Inc. 2023 O'Toole Ave. San Jose, CA 95131 Color 400	Full	Single	No	1	C	No	\$795	Yes, on high-scan monitor	L,B

Special Driver	Resolution	Colors at One Time/Palette	Special Software R-Required S-Supplied	Special BASIC R-Required S-Supplied	Mon Display FS-Full Screen GS-Gray Scale	Monitor Required RGB/Analog/Phosphor/High-Scan	IBM Font Identical	Speed vs. IBM	Flicker
—	512 × 480	4, 8, or 16 from palette of 16	R	—	—	RGB or composite	No	See text	No
—	—	—	—	—	—	Std. IBM RGB or composite	Yes, also single dot font	Same	Severe
—	640 × 200	16 from palette of 262,144	R	S	—	Analog RGB	Adapter determined	Adapter determined	Adapter determined
—	640 × 200, 320 × 200 with optional memory	2 at 640 × 200, 4 at 320 × 200 from palette of 16	—	—	—	High Scan Rate RGB, NEC, TAX, AN, or composite	No, superior	Same	Moderate
—	—	—	—	—	—	Std. IBM RGB or composite	Yes, also single dot font	Same	Severe
—	—	—	—	—	—	Std. IBM RGB or composite	Yes	Faster	Moderate
—	640 × 300, and 640 × 200	136 at 640 × 300, 16 at 640 × 200	R, S (ACT driver and BASIC patch)	S—patches to BASIC A creates BASIC Q	—	Std. RGB or composite	Yes	Same	Moderate
—	640 × 400	16 from palette of 16	No	No	—	High scan rate—PGS SR-12 type	No	Faster	No

VIDEO BOARDS

COLOR CHART

PHYSICAL CHARACTERISTICS

Manufacturer and Model	Length	Single/ Double	Plug-In Modules	Slots Occupied	Output Jacks M-Mono C-Color CP-Com- posite	Light Pen	Cost	Compatibility	
								Standard IBM	P-Plantronics L-Loran B-BASICA
Sigma Designs, Inc. 2023 O'Toole Ave. San Jose, CA 95131 Dazzler I	Full	Single	Yes	1	C	Yes	\$895	No	—
Sigma Designs, Inc. 2023 O'Toole Ave. San Jose, CA 95131 Dazzler II	Full	Single	No	1	C	Yes	\$995	No	—

Mono + Color

Everex Systems, Inc. 891 Maude Ave. Mountain View, CA 94043 Graphics Edge	Full	Single	No	1	M,C,CP	Yes	\$499	Yes	Mono: L, Hercules Color: P,L
IDEAssociates, Inc. 35 Dunham Rd. Billerica, MA 01821 IDE-Agraph	Full	Single	No	1	M,C, CP: optional	Yes	\$995 to \$1,895, depending on speed and memory	No	Custom only
Micromax Systems, Inc. 6868 Nancy Ridge Dr. San Diego, CA 92121 Colormax	Inter- mediate	Single	No	1	M,C,CP	Yes	\$499.95	Yes	Mono: B
Profit Systems, Inc. 30150 Telegraph Rd. Birmingham, MI 48010 MT 1,11GRAPH	Full	Single	Yes	1	1 for both M and C	No	\$499	Yes	Mono: L, Color: B
STB Systems, Inc. 601 North Glenville Richardson, TX 75081 Graphix Plus II	Full	Single	No	1	M,C,CP	Yes	\$495	Yes	L

Special Driver	Resolution	Colors at One Time Palette	Special Software R-Required S-Supplied	Special BASIC R-Required S-Supplied	Mono Display FS-Full Screen GS-Gray Scale	Monitor Required RGB/Analog/Phosphor/High-Scan	IBM Font Identical	Speed vs. IBM	Flicker
—	640 × 200, 640 × 400 w/ appropriate monitor	16	S: drivers, + demo	No	—	Std. IBM-color for 640 × 200, High Scan Rate for 640 × 400	No, single dot	Same on text, graphics much faster	No
—	640 × 200, 640 × 400 w/ appropriate monitor	16	R, S (drives)	—	—	Analog RGB or Std. IBM RGB	No	Same on text, graphics much faster	No
No	Color: 640 × 200	16	R, S, (utility to start color mode)	—	GS-16	Std. IBM RGB IBM-type monochrome	Yes	Same if no Wait state, slower with Wait state	Mono: none, Color: none to moderate depending on Wait state
No	Mono: 750 × 400, Color: 512 × 512 to 1,024 × 1,024	4 at 1,024 × 1,024, 256 at 512 × 512 from palette of 4,096	R	—	GS-16	Std. IBM RGB, composite, Analog RGB, High Scan Rate, and more	No	Faster	No
—	—	—	—	—	—	Std. IBM R ^{TP} or composite	Yes	Mono: same, Color: faster	No
Yes, for mono	Mono: 720 × 348, Color: std. IBM	—	Mono: R, S, Color: S (utility to reduce flicker)	—	—	Std. IBM RGB	Yes	Mono: same, Color: same, but faster with utility	Mono: none, Color: severe, but none with utility
Yes	Mono: 640 × 350, Color: 640 × 200 & 320 × 200	4 at 640 × 200, 16 at 320 × 200	R	—	GS in mono only	Std. IBM RGB	Yes	Mono: same, Color: faster	No

VIDEO BOARDS

COLOR

PERFORMANCE			OTHER FEATURES					
Manufacturer and Model	White Snow/ Black Snow	132-Column Font	Memory			Cost	Serial Port	
			Performance Comments	Board Capacity	Plug-In Module		Clock/ Calendar	Number Standard
Applied Data Systems, Inc. 9811 Mallard Dr. #213 Laurel, MD 20708 VectorScan 512	Black snow	—	—	—	—	—	No	—
Bronson Electronics Corp. 12700 Nicollet Burnsville, MN 55337 Innovation	No	—	Same as IBM Color Adapter incl. "flicker bucket"	—	—	—	No	—
Discortex Corporation 87 Bethpage Rd. Hicksville, NY 11801 CX-1 Color Transformer	Adapter dependent	—	—	—	—	—	No	—
Emulex-PERSYST 3545 Harbor Blvd. Costa Mesa, CA 92626 BoB Board	No	—	—	—	—	—	No	—
MA Systems, Inc. 2015 O'Toole Ave. San Jose, CA 95131 PC Peacock	No	—	Flicker!	—	—	—	No	—
Quadram Corporation 4355 International Blvd. Norcross, GA 30093 Quadcolor I	No	—	—	—	—	—	No	—
Quadram Corporation 4355 International Blvd. Norcross, GA 30093 Quadcolor II	No	—	—	—	—	—	No	—
Sigma Designs, Inc. 2023 O'Toole Ave. San Jose, CA 95131 Color 400	No	—	200-400 line doubler, com- patible w all IBM color monitors	—	—	—	No	—



Number Optional	Cost	Address Adjust	Parallel Port		Cost	Address Adjust	Game Port	Game Port Cost	Other Options and Costs
			Number Standard	Number Optional					
—	—	—	1	0	—	—	No	—	Memory for display
—	—	—	—	—	—	—	No	—	—
—	—	—	1	0	—	Yes	No	—	—
—	—	—	1	0	—	Yes	No	—	—
—	—	—	—	—	—	—	No	—	Extended graph- ics, \$200, down- loadable charac- ter set, \$100
—	—	—	—	—	—	—	No	—	Quadra II Graphics En- hancement, \$295
—	—	—	—	—	—	—	Yes	Standard	—
—	—	—	—	—	—	—	No	—	—

VIDEO BOARDS

COLOR

PERFORMANCE

OTHER FEATURES

Manufacturer and Model	White Snow/ Black Snow	132-Column Font	Performance Comments	Memory Board Capacity	Plug-In Module	Cost	Serial Port Clock/ Calendar	Number Standard
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Sigma Designs, Inc.
2023 O'Toole Ave.
San Jose, CA 95131
Dazzler I

No

—

Fantastic! There's
no substitute for
fast hardware and
lots of memory

—

—

—

No

—

Sigma Designs
2023 O'Toole Ave.
San Jose, CA 95131
Dazzler II

No

—

Great!

—

—

—

No

—

Mono + Color

Everex Systems, Inc.
891 Maude Ave.
Mountain View, CA 94043
Graphics Edge

None in Wait
state; moderate
to severe with
no Wait state

Yes, excel-
lent legibility

Performance de-
pendent on Wait
Generally excel-
lent. Use with
expansion chassis
may be limited

—

—

—

No

—

IDEAssociates, Inc.
35 Dunham Rd.
Billerica, MA 01821
IDEAgraph

No

—

—

—

—

—

No

—

Micromax Systems, Inc.
6868 Nancy Ridge Dr.
San Diego, CA 92121
Colormax

Mono: mod-
erate black
Color: none

—

—

—

—

—

No

—

Profit Systems, Inc.
30150 Telegraph Rd.
Birmingham, MI 48010
MULTIGRAPH

No

—

—

—

—

—

No

—

STB Systems, Inc.
601 North Glenville
Richardson, TX 75081
Graphix Plus II

No

—

—

—

—

—

Optional,
\$29.95

—

Number Optional	Cost	Address Adjust	Parallel Port		Cost	Address Adjust	Game Port	Game Port Cost	Other Options and Costs
			Number Standard	Number Optional					
—	—	—	—	—	—	—	No	—	Graphics Enhancement, \$695
—	—	—	—	—	—	—	No	—	—
—	—	—	1	0	—	—	No	—	—
—	—	—	—	—	—	—	No	—	—
—	—	—	1	0	—	Yes	No	—	—
—	—	—	0	1	\$65	Yes	No	—	—
—	—	—	0	1	—	No	No	—	Clock/ calendar, \$29.95

VIDEO BOARDS

MONOCHROME

PHYSICAL CHARACTERISTICS

Manufacturer and Model	Length	Single/ Double	Plug-In Modules	Slots Occupied	Output Jacks M-Mono C-Color	Light Pen	External Switches	Onboard Jumpers/ Switches	Cost
California Computer Systems 250 Caribbean Dr. Sunnyvale, CA 94089 Supervision	Full	Single	Yes	1	C	No	No	Switches	\$499; \$599 w/graphics
Everex Systems, Inc. 891 Mande Ave. Mountain View, CA 94093 Graphics Pacer	Full	Single	No	1	M	Yes	No	Jumpers	\$489
Tseng Laboratories, Inc. 205 Pheasant Run Newtown, PA 18940 UltraPAK	Full	Single	Yes	No, except with plug-ins	M	No	No	Jumpers	\$680

MONOCHROME

Manufacturer and Model	PERFORMANCE			OTHER FEATURES				
	Black Snow/ White Snow	132-Column Font	Performance Comments	Memory Board Capacity	Plug-In Module	Cost	Serial Port Clock/ Calendar	Number Standard
Californian Computer Systems 250 Caribbean Dr. Sunnyvale, CA 94089 Supervision	No	Yes	132 × 28 and 132 × 44; both readable	—	—	—	No	—
Everex Systems, Inc. 891 Mande Ave. Mountain View, CA 94043 Graphics Pacer	No	No	—	—	—	—	No	—
Tseng Laboratories, Inc. 205 Pheasant Run Newtown, PA 18940 UltraPAK	No	Yes	—	—	384K	64K, \$245; 384K, \$745	Yes	1



MONOCHROME						PERFORMANCE		
132-Column Display	Number of Lines	Resolution H-High M-Med L-Low	Compatibility H-Hercules L-Lotus B-BASICA	Special Software R-Required S-Supplied	Special BASIC R-Required S-Supplied	IBM Font Identical	Speed Vs. IBM	Flicker
Yes	44 or 28	H	H.L	R.S	—	Only in 80 × 25	Same	No
No	—	H	H.L	—	—	Yes	Same	No
Yes	44	H	H.L.B	—	—	Yes	Same	No
Number Optional	Cost	Parallel Port Address Adjust	Number Standard	Number Optional	Cost	Address Adjust	Game Port Cost	Other Costs and Options
—	—	—	—	—	—	—	No	Graphics extender, \$100
—	—	—	1	0	—	No	No	Floppy disk controller, standard cost
1	\$50	No	1	0	—	No	No	—

COVER STORY • JIM FORNEY

VIDEO WIZARDRY WITH PC-EYE

This expansion board will transform your PC into a picture machine and perhaps even turn you into a video wizard.





Imagine: You videotape a live event with a camera or a pre-taped scene with a VCR, and then transfer the images to your PC. The PC digitizes the images and saves them on a floppy or hard disk. Want to alter the picture? Using software, you can retouch the images pixel by pixel. Need titles, credits, subtitles? You can superimpose graphics. Then you can either photograph the finished images from the screen or you can print them out directly.

Imagining this dazzling display of computer imaging technology, you may begin to feel like a video wizard, as I did when I first used the PC-EYE Video Capture System, a new product from Chorus Data, Inc., of Hollis, New Hampshire. Basically an expansion board that turns your PC into a picture machine, PC-EYE can do everything you imagined. The software Chorus Data offers to help you do the retouching and superimpose the graphics is called *IMIGET*.

PC-EYE is a menu-driven hardware and software system that requires only single-keystroke command entries to capture, store, retrieve, and print images that have been digitized. Digitized images have been through the process of being broken up into small, discrete blocks called pixels. Each pixel has a specific location in the image matrix, and each has a digital value that represents black, white, an intermediate shade of gray, or another color. Here's how you use it.

System Menus

The first PC-EYE menu gives you a choice of other menus you may or may not wish to call up each time. The first of these menus configures your system and lets the software know what kind of monitor card, printer, and so forth you'll be using. A file keeps track of the way you've configured the system, and so once you've gone through this menu's questions, you don't need to call up the menu again unless you change the configuration.

On subsequent runs, even if you do



A 4-bit, 640 x 400 image created with a Tecmar board on an RGB monitor.

enter configuration changes, the system retains the original configuration file, unless you go back and reinstall the software. In other words, if I change monitor boards and tell it I've changed, PC-EYE will accept that change as long as I'm in the system. But the next time I call up the program, it will assume I'm back to the old card it shows in the file.

The next menu is a little more complex; it controls the adjustments that optimize the image. Working from it, you use the cursor arrows to adjust the black and the white ends of the image scale to achieve the best visual effect. In my opinion, these adjustments are the most critical you have to make when working with the PC-EYE. You soon get the hang of it with a little practice. Other options from this menu concern other image parameters.

The third menu actually enables you to capture images, store them on the disk, retrieve them from the disk, and send them to the printer. And if you are saving to disk, the monitor displays each image you capture; you can see the image immediately to judge whether or not you really want to save it.

One nice thing about this system is that if you don't like an image you've just saved for posterity, you can keep trying until you get it right. As long as you don't change the filename, each new image will simply write over the old one. And when you get something you want to keep, all you have to do is change filenames and start working on the next image you want to capture.

Using Several Disks

In fact, being basically lazy, I found an even easier way to do this whole routine. If you start with several blank, formatted disks, you don't even have to change filenames—at least not that often. Using your first disk, pick a name and save an image you think is worth keeping. Switch to another disk, same filename, and strike again. This way you have to change the filename only when you run out of disks.

The advantage is that when you want to sort through all the images you've stored for a particular project, you can play the same game in reverse. You can type in one filename and then quickly run through all



The same image as the previous one, with thresholds shifted by a change of exposure.

the disks that used that name, using only a single keystroke to call up whatever image they contain in that name. This method saves you effort spent retyping and time lost switching back and forth between images. You don't even have to re-enter the menu, as long as you don't run out of images with the same name. Just switch disks and hit P for process. A new frame replaces the old one.

Images don't just pop up on the screen with PC-EYE though. The time they take to appear depends on the resolution and the number of image bits. An image produced with an IBM color/graphics card has a file of more than 16K bytes. One of these images fills the screen in less than a second. A full 640 x 400 x 4 Tecmar image from a file of over 131K bytes, however, takes several seconds to write to the screen, starting at the top left corner and writing strips of image, left to right, top to bottom, until the frame is fully displayed.

IMIGET

One of PC-EYE's most interesting features, used with the *IMIGET* software, is

that you can retouch or enhance images you have captured. Although it is intended largely to be used for mixing graphics with video images, *IMIGET* is an icon-oriented program; it allows you to access pixels individually and change them from black to white, or anything in between.

What you do is identify the image area you want to work in and put a box around it, preferably working with a mouse. At the touch of a button, the mouse transports the indicated area up to the upper left-hand corner of the screen and enlarges it several times. You pick up a tone from among the icon selections along the bottom of the screen and go to work. You put the cross-shaped cursor over a pixel and push a button. Instantly the pixel becomes whatever tone you choose.

You can make as many trips back to the icon selection area for different tones as you want; if you make a mistake, you can change it as often as you like until you either get it right or wind up with something you can live with. If you really botch it, you can bring the original image back up from the disk and try again. But be warned, in that case you lose whatever

other masterful work you might have accomplished.

The only real limits are your creativity and patience. You can correct some of nature's worst errors. You can change the tonal separation between adjacent areas, or create separation when none exists. If the background is too busy, you can paint it plain if you like.

Of course, it helps if you're a better free-hand artist than I am. If you're not, you can just keep trying until you've got what you want. Then if you wish, you can save the enhanced image back to a disk, print it on your printer, photograph it from the display screen, or do whatever interests you.

Monitors

For most purposes, the best monitor to use with the PC-EYE is, in my opinion, definitely the composite type—the ones that connect to your PC via RCA phono jacks and coaxial cables. An RGB monitor, on the other hand, won't give you a black and white video image. RGBs don't really like to do grays. Instead they give you colors—wild colors, whether you want them or not. You get seemingly arbitrarily assigned, garishly contrasting colors, even for what should be subtle gradations of gray. The results are spectacular, to say the least, but a little hard to live with for most serious work.

A composite monitor works well in black and white and lots of shades of gray in between. If you have a second composite monitor, you can put it to very good use by plugging it into the bottom jack on the PC-EYE rear bracket. It will continuously display whatever your video camera sees or your VCR sends out. In effect, it becomes a viewfinder for your system while your primary display shows either the last image captured or one of the menus.

The image that comes out of the PC-EYE board rather than the normal monitor card is quite interesting in itself. The people at Chorus told me that it is actually another digitized image. Only this one is a



A 2-bit image created on a composite monitor with a Tecmar board emulating IBM's.

full 6-bit, 128-shade digitization, even though the board I was working with supports only 4-bit images for saving to disk, retrieving, printing, etc. The PC-EYE board image gave me a taste of what those extra 2 bits can do in a tight 640×400 matrix, although I couldn't do any real work with it. The results are positively photographic in quality.

Chorus is also marketing a 6-bit version of the PC-EYE; its people admitted that the differences in the hardware between the two boards are fairly insignificant. Of course, the cost of the additional 2 bits, more than a matter of dollars, is a 50 percent increase in the number of bytes it takes to store an image. (More about this problem later.)

Peculiarities

Working with PC-EYE presents some other peculiarities. At the time I worked with it, the board and the software, plus the preliminary documentation, supported the system's use with any of four of the popular monitor cards. Note: I said supported, not that it was equally compatible or compatible in the same way(s). PC-

EYE seems to look much different even to the boards it supports.

The 4-bit version of the PC-EYE used in conjunction with a Tecmar graphics master will give a full 4-bit image (16 shades including black and white). Image capture times are fairly short. For a full $640 \times 400 \times 4$ image, capture time is about $\frac{1}{5}$ second per image.

With the IBM color card you're reduced to having to choose a $320 \times 200 \times 4$ or a $640 \times 200 \times 2$ image, trading most of your gray tones for increased resolution in the latter mode. A monochrome Hercules board will give only 1-bit images, in black and white with nothing in between. But there's a paradox here; a 1-bit Hercules image uses nearly twice as much disk space as a 2- or 4-bit IBM acquisition, because the Hercules graphics card has a much higher resolution (bits times total pixels in the matrix).

Having played with 1-, 2-, and 4-bit images using various boards, resolutions, and modes, I think it would be a shame to shackle PC-EYE's creative capabilities by using it with anything less than the Tecmar board, certainly now at any rate. The pos-

sible applications for single-bit images in stark black and white seem pretty limited. With a little cheating you can make PC-EYE software think it's got an IBM card when in fact it's got a Tecmar, and if you really want them, you can make it produce 2-bit images.

In fact, you can use a Tecmar board and tell the system up front that's what you're using. Or you can lie, telling the system that it's an IBM color card. You can capture an image either way, although when the system thinks the card's an IBM, you only get a 2-bit image. But if you lie about using an IBM card when you recorded the image, you must also call the Tecmar an IBM board to bring the image back from the disk. Otherwise you get a completely scrambled screen. A genuine IBM color card, however, won't know any better; it will display an image captured by the Tecmar posing as an IBM as proudly as if the image were its very own. But you can't get away with telling the system that the Tecmar you're using is a Hercules; it just won't buy it.

The peculiarities of working with this system continue. If you display an image on your monitor using a Tecmar board, decide that you like it, and save it to a disk, you cannot bring it back up to the monitor via a Hercules board at a later time. It just won't work. If you faked an IBM/PC-EYE format with a Tecmar, you can bring it back either by lying to your Tecmar again or by using a genuine IBM color/graphics card or a very close clone.

Using Other Monitor Cards

Obviously, a number of monitor cards are available, more than those on the rather exclusive list PC-EYE software currently supports. Some are very good. I couldn't resist the temptation to see what would happen if I tried running PC-EYE through some of the cards I had handy that weren't supported by PC-EYE. Clearly, at least some of them, if they aren't compatible already, need only minor software patches to make them compatible.

The Hercules color card doesn't need a

PAINTING BY NUMBER

Computers are the most efficient way to transmit images, whether from outer space via satellite or Lucasfilm, or from the inner space of your mind via your PC. Here's how the computer "paints" those images, pixel by pixel.

It's getting harder to tell where computers leave off and television and other traditional imaging systems begin. Without computerized imaging techniques, you wouldn't recognize many of those fantastic NASA satellite photographs. And without computer-generated animations, many of the special effects you see in movies like those of the *Star Wars* series just wouldn't be possible. With a digital image processing board installed in my PC, I even feel a little like George Lucas.

Pixels

Digital imaging, reduced to simple terms, involves breaking up an image into thousands of discrete little squares or rectangles called "pixels." Each pixel has a specific location so that you can put it back where it belongs in the mosaic, or matrix, as it's called. Each pixel also has a numerical value that describes it in terms of shades of gray or color, hue, and saturation.

This process is very different from that which produces ordinary television. In TV, images are broken up into horizontal lines, and to that extent each line is a little like a string of pixels. But in TV, those horizontal lines are not broken up into discrete units. Television just shoots a little spot along the lines at a fixed speed. As the dot zips along, a completely separate part of the TV circuitry sends information that continuously changes the intensity of the spot. The increments at which this change takes place are not fixed, and for this reason you cannot assign numeric labels to them.

With a little luck, the image turns out to look reasonably decent. The little spot arrives at about the right place on the line, and the intensity circuit does its little dance. But if things go awry, you get an image that is torn or twisted or full of garbage. Because you have no set of fixed references to work from, there's no real way to sort it out.

With digital imaging, each pixel has a numerical value that describes it in terms of color and saturation.

How does breaking up images into pixels, stripping them of their individual identities, and assigning them numbers help in this situation? Imagine a picture of the lunar landscape or the surface of Mars coming in from a satellite in outer space as an example. It has probably already been digitized because that's the most efficient way to transmit data. The transmission picked up a lot of garbage as it came through millions of miles of space. At the receiving end, you take everything that comes in, garbage and all, and feed it into a computer.

In the Computer

First, you put all the pixels in their proper places in the matrix. You can do this step very accurately. If a few pixels lose their identities along the way, however, it's okay. Now you have some tiny holes here and there in the matrix, but you can be sure that they are caused by errors in transmission and recovery. So don't just crowd the pixels together to fill the gaps; you'll deal with them later.

At this point you have an image of something, but obviously with a lot of garbage. How do you separate the good stuff from the garbage? Here the computer really goes to work. Because an overwhelming percentage of the pixels have about the same numeric value, the computer knows that the surface is basically some rather monotonous color, say a rather dull reddish brown.

As the pixels go by, the computer suddenly finds a blue one. The computer says, "No, whatever you are, you're not because blue doesn't fit the norm. So I'm going to paint you dull reddish brown, because that's probably what you are. Even if you aren't, it doesn't matter that much because nobody will ever notice." No matter what odd color that lonely little pixel said it was, it gets colored the same as its environment. The same thing goes for a hole that's lost its pixel; the computer blends it in with the whole picture.

The odds of two or more adjacent pixels picking up the identical defect during transmission are pretty slim; so if the computer suddenly finds a little tightly

(continued)

(Painting by Number continued)

grouped bunch of bright blue pixels, it would have to say, "Okay, be blue if you want, I know the rest of you are still dull reddish brown." At that point a human being may come along and say, "I think you got carried away a little on that blue. Tone it down and try again."

This description is a gross oversimplification of what has evolved into a highly sophisticated technology. However, some of the earliest computer-enhanced images you may have seen probably used techniques nearly as simple.

Image Resolution

When dealing with any imaging system, you have to come to grips with a few basics. One of the most important is image resolution, the actual amount of detail possible to reproduce, or, in other words, the smallest detail that can be distinguished from its surroundings. And in this case, more isn't always better.

Using the Tecmar Graphics Master with the PC-EYE image-digitizing system, you can attain a resolution of 640 pixels horizontally by 400 vertically. That degree of resolution means an object or detail must be nearly $\frac{1}{640}$ of the view wide by $\frac{1}{400}$ high to be seen as a contrasting dot. And it assumes that the object falls neatly within the fixed boundaries of a single pixel, which is unlikely. More typically, an item or detail that small will overlap several surrounding pixels and influence the way they are represented without having a specific identity. If, for instance, half of one pixel were black and the other half white, the average value would be medium gray (about 18 percent); that's how it would be recorded and ultimately reproduced.

A larger detail that occupies one or more pixels, then, will dictate how those pixels show up, while also influencing the reproduction of any adjacent ones it may partly overlap. High resolution

becomes important here. The higher the resolution, the greater the chance that a small detail will have its very own pixels, rather than just muddying someone else's.

However, you cannot deal with the matter of resolution without also taking

No matter what color that lonely little pixel was, it will become the same color as its environment.

into account the number of gray scale steps the system can support. The PC-EYE 1000 I tested is a 4-bit digitizer, so it supports 16 shades between black and white ($2 \times 2 \times 2 \times 2$). Chorus Data also makes a 6-bit system, the model 1100; it will support up to 64 shades of gray. But there's a paradox; more is not necessarily better. It depends on the application.

Contrast

The problem is contrast. The difference between each shade when there are 64 to choose from is more subtle than when there are only 16 or less. As long as you are dealing with a computer, you could have a thousand shades, even ten thousand, and the computer would clearly see the difference between a value of 9,997 and one of 9,998.

But you could look at a raft of 9,997s adrift in a sea of 9,998s for a lifetime and never see them. In fact, you'd be lucky to spot adjacent pixels only $\frac{1}{64}$ apart in value. Reduce the shades to 16, and you

should be able to see the difference. So the paradox is that less detail often produces greater contrast and the visual impression of greater sharpness or detail.

Economics can also be a factor. If you were dealing with, say, the first photos of the planet Pluto, you might be willing to sacrifice a lot of tonal gradation for more pictures. You can transmit and receive twice as many 2-bit (four tone) images in the same bandwidth or period of time as 4-bit images. And since no one knows what Pluto really looks like, any kind of image will tell us something we didn't know before. So more images with less detail might be more valuable than more detail in fewer pictures.

But if you're dealing with images of familiar objects, you expect them to look reasonably familiar. Shades of gray may suddenly become important. Take an image of a human face, for instance. Reduce it to a 1-bit image where there is only black and white and no gray at all, and the effect is surrealistic. Double the number of bits so you have two gray tones in the middle, and the effect is still more like a stylized poster than a photograph. You can begin to accept it, though, especially under the right lighting conditions and if you can juggle the few tones effectively. Double the image's tones again, to 16 (4 bits), and the face starts to look almost photographic in quality—if you've juggled the cutoff points for adjacent values well.

In digital electronic imaging, then, you are limited only by the human eye and the visual process. If you're dealing with a device designed to produce an image pleasing to the human eye and not a bunch of numbers only a computer could love, you have to take contrast and resolution into account. Given a choice between higher resolution and a greater range of gray tones and assuming human visual perception is involved, you should opt for a few less tones so that you have

better contrast to go with the higher resolution.

In fact, with sufficient resolution you need only black and white to reproduce any shade of gray you see. Black and white camera film is exactly that: black and white. You think you see only grays where tiny bits of black and white too small to distinguish blur together in your eye, giving an impression of some tone in between—just like the pixel that was half-black and half-white and was interpreted on average as gray.

Black and white pictures reproduced in magazines or newspapers are a classic example of the same phenomenon. In film the bits of black are random rather than discrete. Printers don't use gray ink to reproduce gray. If they need a light gray, they print a very small black dot in

In digital imaging you are limited only by the human eye and the visual process.

a fixed field that is otherwise white, increasing the portion of the field they color black to produce darker grays. Printers measure dots per inch, but each field occupied by a single dot is really just a pixel by another name. The difference is that if a printer's dots somehow got lost and you had a little pile of them in your hand, all the computers in the world couldn't put them back in order again. With digital imaging and pixels, however, the computer could restore the pixels to their proper place and recreate the image.—J.F.

thing. Just tell the PC-EYE software you've got genuine IBM in there, and it goes off to do its thing. You can save the images to disk or bring them back alive. The same thing goes for the new Paradise modular graphics card used as a color/graphics adapter. If you tell the same lie to the system, you get the same in-and-out results.

The Paradise multidisplay card with a color monitor would display a 2-bit image comparable to what a genuine IBM card would do—if you told the software it had an IBM card. And it would save the image to disk too, but the program would crash in the process. You could also bring the image back from the disk to the screen, but that would crash the program—and at the very same line. When I tried this subterfuge in the mono mode, however, the software would not buy the Paradise multidisplay card as a Hercules, and the program crashed.

Color Images

So far, I have discussed the PC-EYE system as if it were strictly monochromatic. But that's not true. It can record color images directly from almost any video camera that has separate color outputs. The back of the PC-EYE board has four input channel jacks for such applications.

An alternate method produces color video images with a monochrome video camera. However, this process is rather tedious. It involves acquiring three separate images of the same cooperative, dead, or otherwise immobile subject, each through a different color separation filter (narrow spectrum red, green, and blue) and then simultaneously displaying the three images, properly channeled, on an RGB monitor.

When dealing with color, however, you start running into problems of mass storage, especially if you want to work with a tight matrix and at least a 4-bit range of tones or hues. A monochromatic Tecmar 640 × 400 × 4 image requires 131,072 bytes to store. Three times that

(red plus green plus blue) is more than 394K, and 394 won't go into 360. An IBM image capture requires only 16,384 bytes for a monochrome image, so even in color we could squeeze a half-dozen images on a single disk with a little to spare, but at the price of a significant loss of resolution and/or tonal gradation.

Chorus has now come up with another way of significantly cutting the storage space requirements for full RGB images namely, a second board the company has just developed. Thus, color images are processed as 3-bit color images rather than the full 4 bits for the reds and greens, with blues reduced to only 2 bits for a total of 8 bits. By going through this additional board, which will fit a short slot, the storage requirements for a 240 × 400 RGB image are cut by about a third since a total of 12 bits would be required to store three full 4-bit images.

This scheme produces no less than 256 colors, and the resulting images are quite acceptable. And by favoring the reds and greens at the expense of the blues, the loss in important skin tone areas where you would notice it most is not as significant as might be imagined.

Still, we're talking about large blocks of storage memory. Of course, you can store your image data on a hard disk if you have one. But even then, at over a third of a megabyte per three-color image, a hard disk would fill rather quickly.

Another solution is to compress the data, using the compression/expansion software supplied with the PC-EYE. You can squeeze a 4-bit image down to 2 or even 1 bits for storage, then reprocess it back up to 4 bits when you want to use it. This compression/expansion route is far from ideal; it takes about 6 minutes to stomp the air out of a 640 × 400 × 4 Tecmar image and another 6 minutes to pump those little pixels back up again. The 2-bit compression mode squeezes 131,072 bytes down to 64,256, and you can go all the way to 1-bit compression and back if you wish, although I really wouldn't recommend it. Expansion brings them back



A 4-bit, 640 x 400 image created with a Tecmar board on a composite monitor.



Here, white-end thresholds were shifted for greater tone separation in skin areas.

up to 128,256 bytes. You can see that something gets lost along the way.

Actually, the loss is greater than the numbers seem to indicate, for they don't seem to be using an especially efficient compression algorithm. I found that the reinflated images were severely degraded, with a great deal of herringbone even just

to the 2-bit compression and back. However, for images you don't want to throw away yet, this solution works well enough. Then if you needed to use them, you could use the *IMiGET* graphics package to paint out the most objectionable herringbone areas. But you'd need more patience than I've got.

Printing Problem Solved

Obviously then, even with PC-EYE, your personal PC is not yet ready to replace the nice, neat trays of slides from your last family reunion. I found PC-EYE frustrating to deal with when I tried to print out the timeless masterpieces I had saved to disk so that I could share them with the world. The software I had was supposed to

Your PC is not yet ready to replace the neat trays of slides from your last family reunion.

be compatible with IBM/Epson, which is certainly reasonable when you're aiming at the PC market, except that the printer I was using was not IBM/Epson.

However, a call to the technical support staff at Okidata assured me that if I installed their Plug 'n Play set of ROM chips, I would gain instant IBM compatibility for my Microline 92. For some reason Okidata builds their printers with a different pin-firing sequence than the IBM/Epson protocol. You can get by with it very nicely for text, but graphics are another matter.

So I ordered the chips and converted my printer to full compatibility with IBM. The operation was painless enough. The problem was, it didn't solve my problem. I tested my altered printer, even using the test program used in *PC's* printer issue to verify that my printer was now compatible with IBM in the graphics mode. It checked out, but it wouldn't work with the PC-EYE software.

In fact, even if I ran GRAPHICS from my DOS 2.10 disk and proved it was in

THE EARLY DAYS OF DIGITAL IMAGING

Some California researchers at Scripps Institute were performing their wizardry with digital imaging techniques 20 years ago.

There's nothing really new about the technology required to break up an image into discrete units or pixels and assign each a numerical value corresponding to some shade of gray, or even hue and color given sufficient bandwidth. I was first exposed to it nearly 20 years ago at Scripps Institute's Visibility Laboratories, near San Diego. The people there had been using digital imaging techniques for some time even then.

Their work was largely experimental, but in Pasadena at the Jet Propulsion Laboratories, scientists were already applying digital techniques to images transmitted back to earth by both manned and unmanned space probes. By using these techniques, even at that early stage they were able to enhance image quality and to a great extent eliminate snow and other garbage picked up during transmission through space.

Much of the early work in digital imaging was quite crude by today's standards. Computers and computer time were so precious then that for the most part the matrix that the people I visited at Scripps were experimenting with was coarser than the one the PC-EYE board is capable of producing with an ordinary desktop PC. And though they were working in a room full of computers, one of their most important tools was an ordinary toilet plunger. They needed it to lift large floor tiles so they could get at the miles of thick cabling under the false floor.

Yet they were doing some fantastic things even then. Together with astronomers at Mount Palomar, they had used digital imaging to unravel the mystery of what appeared to be a binary star (two stars revolving around each other, too close to be seen as separate with the ordinary optical telescope). They first photo-

By today's standards, the early work in digital imaging was quite crude.

graphed the binary star. These photos looked out of focus and blurred until the researchers reprocessed them digitally into acceptably sharp images that showed the two stars clearly.

Computer Pyrotechnics

In one project, they programmed the computer to design camera lenses for special applications. But that was only the beginning. Suppose they needed a lens to photograph ships 20 miles off shore. Given some basic parameters, the computer would design a lens. But then no lens is ever perfect; most of the imper-

fections are predictable even during design. Plus, pictures are rarely made under perfect conditions. So after the computer had come up with a lens design, the scientists would feed it a digitized image, say of a ship. (They stored their digitized images on tall stacks of punch cards at that stage, rather than on disk.) The computer would then reprocess the image and give it back to them on a Polaroid print, as if the lens the computer had designed had taken the print.

The computer would account for all the predictable design aberrations. The engineers could also introduce typical atmospheric problems, such as bright sun or clouds, haze or smog, or the shimmering effect of a desert on a hot day. If the picture didn't work for that particular application, they could avoid the expense of actually grinding the lens and finding out the hard way.

And it didn't stop there. After the computer gave the researchers a couple of minutes to examine the picture, a little bell would ring impatiently; the computer asked if they wanted to try again but with some changes. If they did, they became involved with such problems as Fourier transfer curves and started over somewhere in the middle of the process.

Their work was very advanced for the time, but I guess you'd have to say we've come a long way. I don't even need a toilet plunger to keep my PC up and running. —J.F.

the graphics mode by calling up and dumping a test graphic to the screen, it wouldn't work with the PC-EYE software. Something in the software was knocking me out of the graphics mode.

At first the people at Chorus Data were puzzled by my problem. But then one morning Bruce Monk, the marketing vice-president of Chorus, called and told me that they had discovered my problem.

IBM/Epson and the "straight" IBM are different. My modified Okidata was emulating the IBM protocol. It was looking for a new graphics Escape sequence at the beginning of each line that just wasn't

there. Once we had identified the problem, Chorus patched the software to circumvent it.

When I did get the images to print, I discovered something rather interesting. When printing on a graphics printer, the PC-EYE system turns the image 90

The circuitry of the PC-EYE board appears to be fairly complex. Its installation, on the other hand, is a reasonably straightforward task.

degrees on the paper. The first line it prints is the extreme left side of your image. From there it proceeds down toward the right side. The process is slow, taking several minutes to print out a whole image. The finished image is approximately 8 by 10 inches.

Installation

The circuitry of the PC-EYE board appears to be fairly complex; a daughter-board piggybacked on the main board accommodates the overflow. The installation of the circuit board, on the other hand, is a reasonably straightforward task. The preliminary documentation that I had to work with was more than adequate to show me how to do the job. Basically, you just take the cover off your PC and plug the board into an empty expansion slot.

However, if you're already using a Tecmar board, you may have to rejump it to a different configuration so that it will

work with PC-EYE. That was the situation I found myself in. The reconfigured board was then not compatible with my IBM green screen; so I had to take the board out and rejump every time I changed functions—not my favorite pastime. If you need an excuse to add a second monitor card to your system (you'll need the slot space to spare), my experience should sway you.

Documentation

I felt the documentation (even in the preliminary form I received) was generally adequate. A basic manual helps you get the board and the software installed and running.

For the more adventurous and technically inclined, PC-EYE has a technical reference manual that details the essentials of what the system can do. (This manual really gave me a scare at first. When I opened up what I thought were the basic instructions, I suddenly found myself reading about Pascal and C compilers, with no information about how to put the board in my PC and get it running. Then I found the basic manual, realized my mistake, and relaxed.)

It Works

It's difficult to evaluate a product like PC-EYE, which, at least at the moment, is unique in the field. You really can't hold it up against a brand X and say, even to yourself, that it does this thing better but isn't quite as good in doing that one. And added to this difficulty is the fact that software support for the system is still in its infancy.

For now, I can report that the hardware and the accompanying software worked. The system did everything I asked it to do, and even a few things they don't have in the book yet, such as working with other monitor cards.

Potential for Use

PC-EYE is at present too new to the marketplace for me to predict how extensive its applications will be in the future,

but already some indicators show that it may have more uses than first meet the eye. Obviously, PC-EYE should appeal to firms that specialize in preparing professional slide shows. And it should be a natural for many graphic arts firms. Both of these two industry groups have shown an active interest in the product. The scientific and medical communities have also expressed interest. In industry, some practical applications are emerging, such as use in inspection and quality control, where optics and optical systems have for a long time played an important role. Telecommunications firms have also been paying attention, but I don't know just what the potential applications there might be. In addition, I'm sure someone will come

It's difficult to evaluate a product like PC-EYE. It's unique in its field, and its software support is still in its infancy.

up with some very interesting, imaginative uses for PC-EYE.

In fact, I would advise Chorus Data to run a contest, complete with an appropriate prize, to see what kinds of applications people can propose—from the far out to the extremely practical. Such a competition would draw attention to the product, which it deserves, encourage prospective buyers, and bring some fun and excitement to a technical endeavor. And, after all, what endeavor can't use some added fun? In fact, I had so much fun using PC-EYE, I had to keep reminding myself that I was working. Perhaps that's the best tribute I can give the system. ■

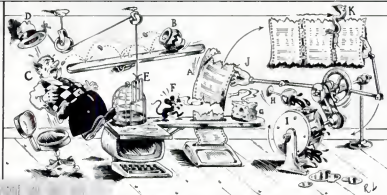
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MOUSE, INSPIRED BY SCENT OF PERFECTLY ASSED CAMELBREAST CHEESE, GUANS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY ALBINO OF OVER-LIFE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

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COVER STORY • JIM FORNEY

THE C-77 VIDEO



MIX-UP



Rapitech's C-77 Video Mixer merges video images and computer-generated text and graphics onto one screen. But does its performance merit its price?

A computer is a computer and video is video, and now the twain have met on the PC. Rapitech Systems, Inc., has developed a compact box that mixes video images and computer-generated graphics and displays them on an ordinary TV screen. The C-77 Video Mixer can simultaneously accept images from a variety of video cameras or VCRs as well as data, graphics, animation, or anything else you can generate on a PC. The mixed output can then be viewed on a composite-type video monitor or recorded on a VCR for later use.

Although the C-77 is limited in terms of what it can do with what you feed it, it doesn't take much expertise, either with video cameras or computers, to get started using it. With very little practice you should be able to put together effective presentations for a variety of purposes.

Some applications that come to mind are trade-show or point-of-sale displays where time or budget limitations effectively rule out more elaborate presentations. I can think of a number of possible applica-

C-77 VIDEO MIXER

tions using grids as overlays, ranging from archeology to zoology. Or you could use ordinary computer data output, either alongside a video image or superimposed on it, provided it were formatted for not more than about 40 characters per full screen-width line. (Smaller characters would be almost impossible to read on a composite monitor.) The ultimate limitation is your own imagination.

The CHARGEN Program

Perhaps one of the likeliest uses of the C-77 would be to superimpose text over a video image. The C-77 mixer comes with software for generating such text overlays, but the people at Rapitech told me not to expect much from it. The software consists of a single program on a disk, and all the manual says is, "Inside the box you will find a diskette with the program CHARGEN. This will allow you to generate characters alongside your video picture. If your computer is not an Apple, Atari, or IBM, a listing is enclosed rather than a diskette."

You don't need any instructions to use CHARGEN, which is a good thing since none are provided. The program asks you a series of yes/no or multiple choice questions to establish parameters and then leads you by the hand as you input copy. CHARGEN has no amenities, such as wordwrap, and it will not permit you to backspace or delete once you've reached the maximum character count allowed for a line. So before you start punching keys,

you really have to sit down and figure out exactly what to put on each line, which lines you want to center, and so on.

After typing in your text, the program asks you for a filename and then uses it to create two separate files. One is the text with the name you gave it; the other is a data file with a "c" prefix before the same name. I was then able to correct some typing errors by calling up the text output file and editing it with my word processor. So all is not lost if you do mess up.

CHARGEN has two text modes: single-size and double-size. Essentially all

The C-77 box itself is strictly a device for mixing, and nothing more.

CHARGEN does is bring up a 34-character line of single-size characters, which gives acceptable clarity on a composite monitor. For most of the applications that come to mind, this limitation won't be a drawback.

I did find what Rapitech calls double-size text extremely limiting, except perhaps for applications in which you've only got one screen of text to overlay continuously over some changing video background. The problem here is that each double-size character is laboriously generated each time through the program, a process that takes about 2 seconds per character, or a little over 30 seconds per 17-character line—the maximum double-size line length.

In the mode that replaces all the text on the screen after some programmed period, this could mean waiting for over 5 minutes for the computer to write ten lines, then dumping it and having to start all over again. For more complex presentations,

this could be combined with single framing for recording on a VCR, but it's a drag for any real-time application.

Single-size characters used in lines of up to 34 characters do not impose the same overhead on the system. The C-77 can write a whole screen of these characters in under 2 seconds at a rate that's interesting to watch.

There are few things in this age of technological miracles that can't be screwed up with a little effort, and CHARGEN's big white letters are no exception. Driving a Sony Trinitron monitor with a Tecmar Graphics Master board, you could do a little creative twiddling with the color and hue knobs, turning single-size white text on a black-and-white background into a visual kaleidoscope of color. With careful adjustment, the multicolor text could be made quite readable.

The same technique, when applied to double-size letters, did not produce the same effect, but it did result in softly colored text, all of some uniform color. Results ranged from sort of chartreuse to almost orange, and at one point I had an interesting blue shadow effect setting off orange text. As an overlay for a monochrome camera image, such gimmicks can make an eye-catching presentation.

The overlays that can be prepared with the CHARGEN package are limited strictly to text, and to just one font of text. By going to one of the more versatile graphics packages such as the various derivations of *Halo*, the graphics that can be created to use in conjunction with either real-time or taped video images are limited mainly by your imagination. I played with a couple of quick screens of graphics that, though lacking in artistic merit, gave me a better feel for the possibilities—and the limitations—of the system.

Muddy Mixing

The C-77 box itself is strictly a device for mixing, and nothing more. It's like putting cream in your coffee—when you pour it in, you have coffee with streaks of cream, but once you stir it everything



C-77 Video Mixer

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blends together. The same is true with the C-77 when you start mixing in graphics. With straight white text, you can saturate the screen and overpower any trace of video that tries to peek through. For more complex graphics, though, shadings or hatch patterns become muddled as the video shows through. For anything besides simple text, you need to lay out the graphics and a video "window" so that they don't overlap and go mushy.

I wanted to "paint" video images into boxes, circles, or assorted odd shapes, but this isn't possible. Instead, you have to lay out your graphics screen and then stick your video window in where it will complement rather than just muddy your graphics. Or you can take the opposite approach and design your graphics around some predetermined video window.

Speaking of windows, I feel that Rapitech's advertising tends to be misleading in a couple of respects. It claims the C-77 unit "features full window control, allowing you to place any size window anywhere you wish on the screen." While it's true that you can move the window on the screen, you can't move the picture that's in the window.

If you start with the whole screen as your window, taking your input either from a camera or a VCR, you get the whole picture on the screen. But changing the size of the window just changes how much and what part of the picture is visible. If the right side of the screen is your window, you will see the right side of the picture you're feeding it, but you lose the left side. If you're working with a camera as your input source, you can simply aim the camera a little to the left to compensate. But if you're working with a broadcast TV signal, either real-time or recorded, your windowing options are pretty limited. As you close your window, you lose part of the image—you can't shrink the size of the picture so all of it will fit.

One of Rapitech's ads claims, "thanks to Rapitech's advances in LSI technology and miniaturization. . . the C-77 comes in a mini-box. . . with a mini price tag." I



The C-77 mixer lets you combine computer graphics and a TV image onto one screen.

felt the box didn't live up to the price tag, and I couldn't resist sneaking a look inside. To do this I had to cut a seal warning that opening the box automatically voids the warranty.

Inside, I didn't find anything resembling a large-scale integration (LSI) chip—just five ordinary-looking chips (with their identifying numbers sanded off)—populating a not-too-busy-looking board with a small handful of other ordinary-looking components.

I called Henry Weiss, the vice-president of the company, and he admitted that the C-77 uses no LSI technology. The identification is removed from the chips, he explained, as a "second level of protection" against anyone's trying to steal the design (the first level is the seal on the box). Weiss hastened to point out that the circuit board is Rapitech's design, and I can't quarrel with that.

I wasn't very impressed by the quality of the unit, either. For one thing, the very light-duty shielded connecting cable that came with the unit failed early in the tests. I'm sure the much higher-quality replacement I bought at Radio Shack for \$3.95 retail could be bought in manufacturers' quantities for well under a buck, and I expect such quality on a \$500 item.

The C-77 uses one of those relatively cheap outboard power-supply units that you can use with small radios or tape recorders. You know—the kind with a little box that plugs into an outlet and then connects to your device with a very flimsy length of wire. It didn't fail, but you can easily yank out the wire.

The C-77 mixer package is badly overpriced, both in terms of what you get in hardware and what that hardware is capable of producing. Since the numbers were carefully sanded off the chips, I can only speculate—but I'll bet I could buy all of the parts retail at Radio Shack for well under \$100, which would probably put the OEM cost at less than \$30 per copy.

Granted, it's difficult to put a value on development and marketing costs, and certainly those costs have to be recovered through sales if a manufacturer is to survive in the marketplace. But, even allowing for the fact that the market for mixers is probably far more limited than for many other popular add-ons, Rapitech's numbers seem quite high.

While the Rapitech C-77 unit is an interesting camera/computer graphics image mixer, its performance was not up to my expectations. And it certainly isn't a bargain at the price. ■

COVER STORY • DAVID POWELL

GETTING ON THE AIR

Your PC can produce video images that, with modification, can be broadcast over the airwaves. This television magic comes to you with help from a box called a time base corrector.



Video Illustration: Great Kudu, Bob Corbett

If you have spent much time creating images (especially animated ones) using the IBM PC Color/Graphics Adaptor, you've probably contemplated "dumping" those pictures to videotape. If you have a Betamax or VHS home video recorder, you will have some success recording directly from the color graphics card's composite output jack. But for its own reasons, the IBM PC produces video signals that are not quite standard. These signals will make any broadcast engineer shudder. To send such images over the air, you must first deal with certain technical and legal considerations.

In this article David Powell reveals how to program the Motorola MC6845 CRT controller, at the heart of the PC's color graphics card, to produce images acceptable to the television industry. By following the author's guidelines, you can process screens that have been output to nonbroadcast home or 3/4-inch videocassette formats through a magic box called a time base corrector. You can then re-record them on professional equipment or broadcast them over the airwaves. Here's how Powell says to go about it.

The IBM Color/Graphics Adaptor is based on a Motorola MC6845 CRT Controller IC. This design gives you various capabilities IBM saw no reason to support in the software it supplies. The one you need to concern yourself with in your efforts to produce images that can be broadcast on television is the selection of interlace sync.

Using BASIC, you can access the 17 registers internal to the controller on the color/graphics card in two steps. First, put the desired register number, in this case number 8, OUT to port &H3D4, which is 980 in decimal (quicker to enter in BASIC), to load the address register. Then, the machine will direct whatever byte is sent to the next port, number 981, to register 8. One minor complication is that access to any register in the MC6845 via the BASIC interpreter will require use

of the address register. Therefore, to change a parameter in the controller from BASIC, you must enter both OUT commands on the same line. To select interlaced sync, enter

```
OUT 980,8: OUT 981,1
```

To return to normal, enter

```
OUT 980,8: OUT 981,2
```

You can select the interlace mode in any SCREEN mode. This mode will change the appearance of your screen,

The IBM Color/Graphics Adapter's scan rates are very close to those of standard broadcast television.

whether graphics or text. Less, if any, gap should appear between scan lines, making the vertical components look more solid. Most noticeable, however, will be a definite flickering.

The IBM Color/Graphics Adaptor, like most computers (with the exception of the IBM Monochrome Adaptor), generates horizontal and vertical scan rates that are very close to those of standard broadcast television, in this case within 0.22 percent. Designing the board this way requires no special monitors. When resolution is not a critical factor, you may even use a standard TV receiver with a modulator. Since the vertical rate is close to 60 Hz and the horizontal near 15,750 Hz, the number of scan lines is only about 262 (exactly 262 for IBM). You need at least 20 lines to allow time for the electron beam to return

to the top of the screen to start the next frame. Thus the practical limit to vertical resolution is about 242 lines, of which IBM uses 200.

So how can some video systems claim 400 to 480 lines? This is where the interlace technique enters the picture.

Two Identical Fields

The video standards (RS-170A) used in this country were developed in the 1950s. They carry the initials of the developing committee, the National Television Standards Committee, NTSC. (Despite what some engineers claim, NTSC does not mean Never Twice the Same Color.) These standards were built on the older, monochrome standards, which include interlace and specify 525 scan lines. Alternate vertical fields, occurring at about 60 Hz, have vertical sync pulses shifted one-half line in time. The result is that each visible field of scan lines fits between the lines of the other, effectively doubling the number of lines on the screen. Any computer or board producing over 242 lines of vertical resolution on a standard TV or monitor must use interlace. When you select interlace in the way described above, you produce two identical fields per frame, showing a total of 400 lines vertically. But since you don't have the on-board memory for addressing both fields separately, you get 200 line pairs.

Why the flicker then? When all points on the screen are illuminated 60 times per second, persistence of vision smoothes the flicker (if you don't think it's flickering all the time, shoot it with a still camera at less than 1/60 second to see how much is lit at any given time). When you select interlace, each point is lit only 30 times per second, and a definite flicker appears.

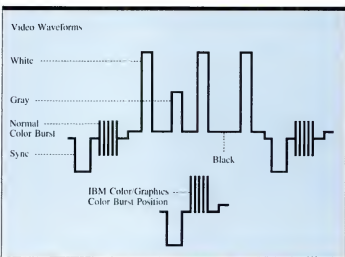
But, you ask, why doesn't my TV flicker? TV cameras used in broadcast cannot resolve any point or line small enough to turn one line on and the next off; operators of electronic graphics generators quickly learn about the problems of picture elements that are too small. The smallest electronic characters superim-

posed on the screen are almost always twice the height of your 40- or 80-column text. In a nutshell, flicker appears only when adjacent scan lines have brightness levels that are radically different from most text and line graphics from computers, especially in narrow lines. Interface would cost about the same as IBM's standard setup, but, considering the problem with flickering, you can see why they chose not to use it.

The luminance component of a video signal conveys information about brightness. In broadcast TV it is mostly in lower frequencies, below 3 MHz, and the resulting picture is displayed on a monochrome TV or monitor. A 3.58-MHz "subcarrier" is mixed onto what is called the back porch of the horizontal blanking (retrace) period to identify and synchronize a color signal. This subcarrier is mixed with the luminance component to generate color areas in a picture; its phase and amplitude corresponding to the hue and the amount of color. Mixed with luminance, this subcarrier is called the chroma signal.

Preparing to Broadcast

Putting your mono graphics or 40-column text on the air is pretty simple. You can generate some beautiful key signals. The main problem with the signal is that the horizontal and the vertical frequencies are not quite within legal specs. Also, there is no simple way to drive them using external reference signals. However, nearly all broadcast stations now follow standards for U-Matic and/or one of the two 1/2-inch broadcast-quality tapes. When such tapes are aired or transferred to another tape format, their signals are processed through a time base corrector (TBC). The TBC removes the jitters and other timing instabilities inherent when video is recorded mechanically. Since in these formats the chroma and the luminance are processed separately, you can correct the slight frequency error in luminance without any adverse effect on the chroma. The TBC also adds sync pulses of proper widths to suit the ever-watchful FCC.



This wave form demonstrates full interlace; first come 50 lines of monochrome characters, followed by 16-color 80 x 50 full interlace graphics.

Color signals will look quite good when they come out of the TBC, but you must consider a few additional factors when preparing to broadcast. One of these factors concerns an oversight IBM made when it designed the composite output of the graphics card. Most broadcast equipment and many newer TV receivers and monitors (including the Zenith ZVM-135) use the back porch of the horizontal blanking interval as a reference for DC restoration. The design of such a clamping circuit causes it to integrate any high-frequency signal on this part of the waveform, thus (for this purpose) ignoring the color burst. Instead of mixing the burst onto the back porch, IBM saved a few pennies by adding it atop the back porch, causing the average DC level in this area to be far too positive. The result, as many have already observed, is that the picture becomes considerably darker in color modes, though not on monitors using the RGB outputs. You can correct this darkening fairly easily in the TBC by adjusting the SETUP control.

When programming for broadcast, then, include within the program, after

SCREEN or WIDTH statements, the line of code displayed at the beginning of this article to select the interface mode. Remember, when in color modes, colors 1 to 6 are the same luminance level (brightness) as colors 9 to 14. Monochrome TV receivers and monitors will not see any contrast within these groups.

A few more things to keep in mind: A frame synchronizer with heterodyne capability, if available, can also be used to correct the interlaced IBM signal. Also, I have found that a Sony U-Matic TBC will not accept the slightly nonstandard vertical sync from the IBM.

For "Techies" Only

If you are technically inclined, you'll be interested in the following comments. Previously I used "at least" and "about" in referring to numbers that could be expressed quite accurately. Here I give some more precise figures for those of you who may be number freaks.

Thirty years ago, starting with a precolor 60-Hz vertical (used to minimize the appearance of hum bars from the equipment of the time) and a 15,750-Hz hori-

NEW WAVE VIDEO HELP

CAV, a new line of software takes the problems out of producing video as it helps you plan, budget, schedule, write, and edit.

Comprehensive Video Supply Corporation of Northvale, New Jersey, wants to help lighten the video producer's workload. It is offering a line of software packages called CAV, Computer Aided Video. At the moment, the CAV line consists of four software packages: a filing system, a management planner, a script-writing word processor, and an editing aid. Comprehensive says additional ones will appear soon.

Datafax, the electronic filing system, stores all kinds of textual information. This system is handy for filing video scripts, since you don't have to enter your data in a special format. Besides filing, retrieving, and cross-referencing information, *Datafax* does other useful tasks like printing mailing lists.

Associate Producer, CAV's management planning system, is a set of four programs written by Lon McQuillin, a California producer of commercial and educational video. *Production Budget* helps you plan a budget; then *Budget Tracker*, a sort of computerized accountant, keeps track of your expenses after production begins. *Production Schedule* helps you plan the shooting of your video show, and *Program Rundown* creates your program schedule. The computer's ability to calculate is particularly helpful in this last instance. As you enter changes, it instantly recomputes your time schedule, relieving you of tedious paper and pencil calculations.

Powerscript, a word processor for video scriptwriters, was produced by New Yorker David Guest. A video professional, Mr. Guest's primary objective was to make script writing as effortless as

possible, so writers could spend time and energy writing, not juggling pagination, manipulating tabs and margins, or maneuvering the cursor around the screen. *Powerscript* gives you the option of a two-column format so that camera instructions and the words of the script can appear side by side on the printout. If you delete several paragraphs from either the camera column or the script column, the two columns won't lose their alignment. The camera instructions never leave their position alongside the corresponding words of the script.

Martin Spinelli, a New York video producer who uses *Powerscript*, wrote 30 manufacturers of word processors, searching for the product that would best help him write his video scripts. Only five companies responded, and of these, only *Powerscript* could handle the two-column coordination mentioned above. Spinelli feels that the program makes putting your script on paper as trouble-free as possible. In fact, when he started to use *Powerscript*, he found that he no longer needed a secretary.

The final program in the CAV line, *Edit Lister*, is another creation of Lon McQuillin. It takes on the challenging task of video editing. Video editing can be difficult since videotape, unlike film, has no visible picture frames. You must use special equipment to make smooth cuts and joins, and very precise timings are required to produce an unobtrusive cut. *Edit Lister* keeps track of your editing decisions and timings, and, when used with a paper-tape machine (a tape printer) in conjunction with an optional program module, *Edit Lister* can print

out a tape that communicates directly with the final editing equipment.

Bob Weigand of Square 12 Corporation says not only has *Edit Lister* cut down greatly on his editing time (he no longer needs to erase and do multiple recalculations each time he makes an editing decision), but it also gives him the power—and time—to be more creative. Bob recently was asked to edit a 35-second videotape of a haute-couture fashion show. When he saw the rushes, he discovered that the models did not come across well and only 5 seconds of the tape were usable. With *Edit Lister* he was able to slow down the usable part by 7 times its normal rate, filling the 35-second hole and at the same time achieving what he felt to be an unusual and rather breathtaking effect.

Edit Lister can also save a video producer money when it comes to the final edit, which is usually done with equipment that rents at about \$400 an hour and up. *Edit Lister* feeds instructions into the editing machine far more rapidly than can be done manually, cutting down considerably on editing time and thus the rental costs.

You can buy the CAV programs individually, choosing only the package or packages you feel you need. And according to Martin Spinelli and Bob Weigand, Comprehensive Video Supply Corporation supports its customers with high-quality backup. They say that when it comes to answering your questions, the staff, as well as producers Guest and McQuillin, are exceptionally supportive and generous with their time.

—Rox Tobias

```

100 ' INTRLACE.BAS
110 '
120 DEF SEG=&HB800: WIDTH 80: SCREEN 0: OUT 980,8: OUT 981,3
130 FOR ADR=0 TO 8000 STEP 2
140 POKE ADR,33+(ADR/2) MOD 90: POKE ADR+1,7: NEXT ADR
150 IF INKEY$="" THEN 150: ' Hit any key to go on.
160 FOR ADR=0 TO 8000 STEP 2
170 POKE ADR,219: POKE ADR+1,RND*16: NEXT ADR
180 IF INKEY$="" THEN 180 ELSE OUT 980,8: OUT 981,2@1: CLS

```

This program, written in BASIC, produces interlaced 16-color 80 x 50 graphics.

zontal, RCA/NTSC developed a set of frequencies designed to minimize beats when color was added to the existing monochrome video signal. They began with the 4,500-MHz intercarrier frequency, the difference between transmitted aural and visual carrier frequencies on any TV channel. They then chose an integer that could be divided into that frequency to yield a frequency close to 15,750. The integer they chose was 286, which gave the horizontal the new frequency of 15,734.26573. This number divided by 525 lines per frame produces a frame frequency of 29.97002997 Hz and a field (vertical) rate of 59.94005994. RCA then picked a color subcarrier that would fall between the horizontal-frequency-spaced sidebands of the visual carrier while allowing room for its similarly spaced color sidebands to extend 0.5 MHz on either side (exactly 227.5 times the horizontal frequency, or 3.579545454 MHz).

In practice, the master oscillator in broadcast is at 3.579545 MHz \pm 10 Hz or a multiple thereof, and all video frequencies are derived from that. The transmitter frequencies are generated independently, but theoretically all these frequencies could be derived from a single source. All would bear the precise ratios.

IBM derives its frequencies from a 14.318-MHz master clock oscillator on the system board, 4 times the frequency of the NTSC color subcarrier. The clock for the CPU is that clock frequency divided by

3. The Color/Graphics Adaptor divides the master clock by 4 for the subcarrier. But to make both high- and low-resolution modes possible inexpensively, it was simpler to divide the subcarrier by 228 instead of the ideal 227.5 (usually achieved by dividing

When all points are illuminated 60 times per second, persistence of vision smoothes the flicker.

twice the subcarrier by 455). This causes subcarrier cycles on successive lines to be aligned vertically instead of having the usual alternate phase between lines (hence the vertical lines seen in a monochrome monitor on a color signal from the color card).

Monitors and TV receivers with comb filters properly process the chroma; the luminance resolution is slightly reduced, since the scan line is 139.68 nanoseconds too long for the design of their delay lines. For this reason, the receivers and monitors interpret some high-frequency luminance information as chroma and cancel it. TBCs also separate chroma and luminance

using comb filters; they effectively shift luminance timing to match the NTSC frequencies. Because many combinations of pattern and text edges from the PC are at subcarrier frequency, which need not be shifted for NTSC, I had expected to notice roughness on the edges from the PC. But in fact, roughness was insignificant.

If you'd like a programming exercise, switch the interface selection line to interlace sync and video, yielding true 400-line vertical resolution

OUT 980,8: OUT 981,3

The 16K of RAM on the board limits practical use of this mode to text applications (it repeats graphics in the lower half of the screen, offset by 584 bytes). In text the result is a 50-line display, with the expected flicker. In practice, you must employ direct memory access to use this mode. The paging ability of BASIC is not usable, although the lower half of the screen is mostly comprised of the next page since IBM uses pages of multiples of 2,000 bytes instead of 2,048. Using the MC6845 directly like this requires direct memory access. It opens up many possibilities, such as producing interlaced 16-color 80 x 50 graphics (see the figure showing the demonstration program), but if you're in BASIC, you're stuck with using POKEs to produce them.

That's probably more than you really wanted to know. Good luck, and put your imagination to work on the air! ■

APPLICATIONS • SCOTT KARIYA

The PC Pied Piper Of North Dallas

Computer expert Father Rudy Koss shares both his love of computers and his PC with the kids in his North Dallas parish. When trying out new games, no one's eyes light up more brightly than his.

Illustration: Kinoko Craft







When Dave Brennan, a sophomore at Pearce High School in North Dallas, Texas, has free time after school or in the evenings, he spends it working on an IBM PC—either writing book reports using *WordPerfect*, learning applications, such as Lotus' 1-2-3 or *dBASE II*, or honing his eye/hand coordination skills by playing *Cosmic Crusaders* or *Laser Maze*. In many ways, Dave's time spent on the PC is similar to that of thousands of other fortunate kids across the country. The one difference, however, is Dave's mentor, whose PC skills are so accomplished that he beta-tests programs for major software developers. Dave's PC adviser also assists local computer stores in evaluating new products and helps local businessmen with difficult application problems. That is, he does all this when he is not saying Mass. Dave's PC guru, Rudy Koss, is a Catholic priest.

Computer Neophyte

At the time Father Rudy Koss received his first parish assignment in North Dallas in August 1981, he had no experience with computers. His congregation at All-Saints Church exposed him to micros for the first time and inspired him to develop his first major application.

"I became Youth Minister," recalls Father Rudy, "and I saw the kids' fascination with computers. It was like the early 1960s when a home with a color TV became the center of the neighborhood universe." Parish teens and preteens flocked to the nearest home with a computer. Their fascination fanned his growing interest in computers. "I started coordinating youth activities and found I needed a system to keep track of the large number of kids in my parish." Although he could have turned the task over to the church secretaries, his kids' enthusiasm for computers gave him another idea. "Although it was beyond my budget to buy a computer, I decided a file on the kids would be a good application for a

database," Father Rudy says, adding: "Back then I didn't even know words like 'database.'"

After working for a while with Apple computers belonging to his kids, Father Rudy received a gift from a friend, a Dynasty computer that ran CP/M. He then acquired *Spellbinder*, a word processing package, and *dBASE II*. With absolutely no prior programming experience and only a few poorly written hardware manuals to guide him, he struggled to master the rudiments of his system. "I read everything I could get my hands on about the system, but I wasn't getting too much out of it," he remembers.

Moving on Up

Before long, Father Rudy realized his frustrations were caused by the limitations of his hardware, so he began shopping for a more capable machine. His first experience with computer retailing was rather unpleasant. "I went to a store to look at Apples, and the salesmen wouldn't talk to me. They thought I was looking for a freebie. All I wanted to do was find out what I needed, what the Apples could do, and what they could offer me. But the salesmen were very cool, so I left."

Father Rudy's next stop was Compu-Shop, an authorized IBM dealership where he knew one of his parishioners worked. He was invited to examine the store's new IBM PC arrivals; the experience led to the start of a beautiful friendship. "I could see right away that the PC had more power and expandability than the Apple," he recalls.

Enlisting the financial aid of several parishioners and putting up some of his own funds, Father Rudy purchased a PC—just 3 months after IBM announced its PC to the world. It was a moderate system, with 64K (on the motherboard), two drives, monochrome display, and matrix printer. Father Rudy purchased IBM's *Time Manager* for appointment scheduling, and he wrote for and received PC-DOS versions of *dBASE II* and *Spellbinder*. And he began reading—every-

thing. "The first thing I did," he says, grinning, "was to subscribe to *PC*. I read it from cover to cover."

Keeping Tabs on Kids

With a roster of over 200 teenagers in the parish, Father Rudy needed the power of a PC and a data management system like *dBASE II* to keep track of names, addresses, and personal information such as birthdates and favorite activities. Using the same programs, he found he could coordinate church activities through PC-generated mailings. He also learned to computerize altar boy scheduling. With over 64 boys eager to serve in the requisite

Father Rudy gets along well with kids because, in many ways, the PC brings out the kid in him.

50 masses needed to receive the prized Bronze Cross award, Father Rudy began to rely on the PC to ensure the fair distribution of slots and to remind him about the due dates of awards.

Father Rudy also began using his PC to write his sermons. "I used to write them out by hand or type them when I could steal away someone's typewriter," he recalls. Now, with *WordPerfect*, his weekly messages almost never appear on paper until just before he delivers them. Like many writers, Father Rudy believes his PC makes his writing not only faster, but better as well.

Another major application employed by Father Rudy was appointment scheduling and time management. After becoming familiar with time management systems through IBM's *Time Manager*, he surveyed the market and decided to pur-

chase *Shoebax*, a comprehensive time management program. Putting his calendar under the control of his PC was not without its drawbacks at first. As one mother in his parish recalls, "Father Rudy was supposed to give a talk at my son's school. But he never showed up, and we couldn't figure out why." She later learned that an accidental erasure had wiped out Father Rudy's day's activities. Now he prints out his calendar several days in advance.

Father Rudy's expertise developed rapidly with the help of local computer experts like Arlene Imberman, who owns a software and peripheral equipment outlet

other professional PC consultants, Father Rudy voraciously reads computer publications. When he hears of a new program that sounds interesting, he contacts the company and offers his services as a beta-tester. By his own admission, Father Rudy is fairly well known in software circles as "that priest in Dallas" who reports bugs and suggests improvements for the next releases. This odd but happy relationship between high-tech entrepreneurs and a parish priest has worked to the mutual benefit of both parties. Companies get a thorough testing of their product, and Father Rudy pores happily for hours over the latest software and saves his money for

Father Rudy's relationship with kids is special. Older parishioners call him "The Pied Piper of North Dallas." The teenagers in his parish relate to him as a peer and as a counselor. Almost every night teens crowd into his small office, with eyes fixed on the PC's monitors.

The PC has become an integral part of Father Rudy's ministry. If he is not using it himself to track altar boy schedules or write sermons, there will be anywhere from a single boy writing a book report on it to a gaggle of youths cheering each other on in some arcade game.

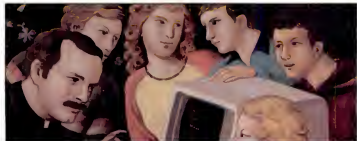
It would appear that one reason Father Rudy gets along so well with kids is that in many ways the PC brings out the kid in him.

Future Looks Bright

Construction has begun on a new rectory that will house a youth lounge equipped with a wide-screen television and nine Apple computers that were recently donated to the church.

And, of course, Father Rudy has plans for more computer work. He'd like to track the people whose lives he's touched through weddings, baptisms, and other church functions. Many of them have moved to different parts of the country or are no longer active members of the church. "I'd like to be able to send these people a note on their anniversaries to let them know the church remembers them," says Father Rudy. "I want them to know they'll always be a part of us."

Then there are the more ambitious projects. Other churches in the diocese already have or are thinking of acquiring computers to aid with administrative work. Perhaps some sort of database linking computers in other churches through telecommunications lines might be a new project for Father Rudy. Fortunately for him, he'll have expert guidance for whatever use his PC is put to next because Entree Computers, the fast-growing national chain, recently opened a Dallas outlet across the street from All-Saints Church. Divine providence? ■



three blocks away from All-Saints Church. Father Rudy called her to inquire if she stocked word processing programs. He went over, purchased some programs, and returned home. When he called back the next day to report problems in running the programs, Imberman went to the church to assist. "One thing led to another," she recalls. "Within the next 3 or 4 months, I was talking to him almost daily." Imberman became Father Rudy's PC counselor, but it did not take very long before the tide turned. "Instead of my recommending programs to him, he began recommending new things to me," Imberman says. "He uses his computer probably more than anyone else I know." Father Rudy is the only person Imberman knows of who has had to replace his keyboard because of wear and tear.

Besides conferring with Imberman and

his next hardware purchase.

Father Rudy sold his first PC over a year ago to purchase the "PC-2" with 256K memory capacity on the motherboard. It was a harbinger of things to come. Father Rudy's small office may hold some record for the "most computer gear per square foot." His setup now consists of two monitors, one color and one monochrome, the system unit, and a hard disk expansion chassis. He still has his first Okidata printer but now does most of his letter printing on an NEC Spinwriter and a newly acquired sheetfeeder. His modem connects him with The Source and CompuServe. Software manuals vie with religious books for space on his bookshelves. But oddly enough, it is not hardware or software alone that excites Father Rudy's interest in computers. His kids have played a major role, too.

Accounting For Individual Tastes

Designed for very small businesses, Rags to Riches offers spreadsheet features that strike a happy medium between structure and flexibility.

From rags to riches—the dream of many a small-business entrepreneur. But when the entrepreneur isn't dreaming of success, he or she must wear any number of hats in starting and running a new business. Unfortunately, one of them belongs to the bookkeeper, and bookkeeping expertise doesn't come with the hat!

Many budding entrepreneurs (and those who simply need to account for one or more "personal" investments) balk at the thought of having to deal with a highly structured, computer-based accounting system. As a result, many who choose to do their own books do so manually. Some use a spreadsheet—although this method often proves to be awkward and ineffi-

cient. Is there no middle ground between a totally unstructured spreadsheet and a highly structured, automated accounting system?

Chang Laboratories Inc. (long known for its CP/M-based productivity software line) recognized this dilemma. The company went to work on the problem and developed a unique accounting system designed for very small businesses: *Rags to Riches*. Originally released in July of 1984, *Rags to Riches* is targeted squarely at the small business with just a few employees.

The key to the system is that it allows you to input data and observe the results immediately. And we mean immediately! Although *Rags to Riches* lacks the analyt-





Illustration: Carter Goodrich

INDIVIDUAL TASTES

ical capabilities of an electronic spreadsheet, the designers wanted to give the system a spreadsheetlike feel. So the bottom half of the screen is dedicated to a condensed presentation of your profit/loss statement and balance sheet. As you enter transactions, the program immediately presents the bottom-line financial impact of the transaction. It can do so—on-screen in real time—because it is a memory-resident (RAM-based) system. That is, all your data and your account balances are maintained in memory, just like an electronic spreadsheet.

With the exception of a very few functions (such as check writing in the Payables module), nothing is done in batches. Each transaction is posted individually, and account balances are updated the instant you enter it. This makes for an unusual and interesting product. One of the objectives of continually displaying the changing financial statements is to tutor the businessperson who may not be quite sure what effect an entry will have on account balances or financial statements.

Flextime

In accounting, we normally deal in specific reporting cycles; the books are "closed" at the end of each period. With *Rags to Riches*, you never really close the books. As discussed above, all transactions are posted immediately upon entry. However, they are posted to the "current" amount (the account total). You can continue posting transactions, and they will continue to accumulate in the current account field, until you decide to update your current data. When you perform this update, the current amount fields



Rags to Riches

Chang Laboratories Inc.
5300 Stevens Creek Blvd.
San Jose, CA 95129
(408) 246-8020

List Price: \$99.95 per module

Requires: 128K RAM, one 360K disk drive, PC-DOS 2.x.

Command Reference					
DATA	AUDIT	FILES	EDIT	SUMMARY	
DEPOSIT	CLEAR	OPTIONS	Asset	CLASS	Asset
CHECK	EDIT	EXIT	Liabilities	Liabilities	Liabilities
MONEY	POST	UPDATE	N/Worth	N/Worth	N/Worth
PAYABLE	REVERSE	CURRENT	Income	Income	Income
TRANSFER	NEXT	M-T-D	Expense	Expense	Expense
POST	LAST	Y-T-D		PRINT	
REVERSE		MERGE		TOTALS	
NEXT		Sales		CURRENT	
LAST		Receiv		M-T-D	
		Payable		Y-T-D	
		LOAD			

F1 Cancel	F3 Line Begin	F5 Delete Character	F9 Command Help	END Menu	Left	Right
F2 Delete Line	F4 Line End	DEL	F10 Switch Help Line	Backspace	Enter the Left	Down

*With the PCjr you must depress the Fn Function Key before using the F1-F10 keys.

Figure 1: The Rags to Riches Quick Reference Card. Each module has one.

for each account are "rolled forward" (added) to the respective M-T-D (month-to-date) fields, and the current fields are cleared to zero. You can continue entering and accumulating current transactions and updating these amounts into the month-to-date fields until you want to update those month-to-date amounts into the Y-T-D (yes, you guessed it—year-to-date) fields.

Consider the analogy of three buckets. As you fill up the first bucket, you can empty it into a second, larger bucket at any time you choose. As the second bucket fills, you may choose to empty it into the third, or largest, bucket. At the end of the year, you will empty the largest bucket onto the ground and start anew.

It is not unusual that you can control when updates occur. What is unusual is that this system is not at all date sensitive. The dates associated with your financial transactions do not determine the accounting period they have an impact on. The calendar, in general, is left up to you. With a few exceptions, transaction dates have no meaning to the system. The assumption is that you will keep things straight and logical as far as dates are concerned. The system's responsibility is to maintain the chronology of the journal entries and to make sure you balance your debit and credits. This gives you a great deal of flexibility and responsibility.

Giving Credit for Debits

The system's method for entering financial transactions helps keep your books in balance. A debit-credit transaction is specified by entering two different accounts and a single amount. This amount is debited and credited to the two accounts respectively. Your books cannot be out of balance, but neither can you enter transactions for which there are multiple debit or credit accounts—such as a loan payment transaction in which your checking, interest expense, and loan payable accounts are all affected. This may prove frustrating. However, splitting these transactions into two or three entries may be a small price to pay if you have trouble balancing your statements and have few complex transactions.

Rags to Riches resembles a spreadsheet in a number of ways. For instance, if you use Lotus's 1-2-3, you are likely to feel right at home with the horizontal command menus and edit functions. As with RAM-based spreadsheets, *Rags to Riches* gives you the option of loading or storing data on diskettes separate from the program files. However, because all the data is memory resident, you'll need to remember to save it frequently.

Another spreadsheetlike feature you'll be pleased to see is that you can enter simple formulas in amount fields when you're entering numeric data. These formulas are

limited to one math function and a single percentage calculation. The following formulas would be legal: for an interest amount, $10 \text{ percent} \times 14,000$; for a discount amount, $490.00 - 15 \text{ percent}$; for a surcharge amount, $37.20 + 10 \text{ percent}$. As you can imagine, this can come in handy in entering transactions associated with sales tax, discounts, and the like.

A Help key is available to display additional information regarding a particular command—although you'll need the reference manual as well. In addition to this on-call help facility, there are three levels of constant on-screen help, which give you strong incentive to graduate quickly to the expert level. The beginning level obscures the "results" part of the screen. You'll soon not need that much help. The intermediate level features a one-line message continually scrolling from right to left on the screen. It is a little hard to stomach; it's like trying to enter your accounts while sitting on a turntable!

Because the system is RAM-based, you may run out of room for your transactions. However, you can enter about 1,000 transactions before this becomes a problem. A number displayed in the lower left-hand corner of the screen indicates about how many transactions you can add before you need to do some housekeeping. If you do bump up against your system's memory capacity, you'll have to follow the procedures outlined in the documentation for "clearing" (deleting) some of your transaction detail.

The *Rags to Riches* bookkeeping series includes General Ledger, Accounts Payable, Accounts Receivable, and Sales modules. You are able to use each module on a standalone basis if you wish. However, the latter three modules can give you financial data for the General Ledger module.

General Ledger

Integration of your accounting data is straightforward and easy to accomplish. Within the subsidiary modules (Payables, Receivables, and Sales), you simply

establish accounts consistent with those in the General Ledger. Then, using the merge function within the General Ledger, you merge into your ledger accounts the financial data residing in these subsidiary modules.

Once you understand the general approach of the *Rags to Riches* software, the General Ledger module is relatively simple. Figure 1, which illustrates the command reference card for this module, contains a complete outline of the menu options.

One of the most appealing aspects of this "low-end" accounting software is the manner in which you define your financial accounts. Most traditional accounting software uses numbers for account codes. For example, your cash account might be account number 100, your petty cash account, 110. Targeting this system for the very small business, the developers of *Rags to Riches* recognized that these businesses seldom need more than, say, 100 different accounts to adequately segregate their accounting records. So they chose to allow the user to assign a single character as the code for each account. Because special characters can be used and both uppercase and lowercase letters are distinguished in this scheme, you can create up to 96 different financial accounts. This feature significantly increases the speed with which you can enter accounts. More importantly, it allows you to search for the right account as you are entering the account code. You simply "let your fingers do the walking." As you step across the keyboard tapping each key, the account description associated with that key will appear. When you've found the right one, you just hit Enter.

By including some 30 complete charts of accounts for representative small businesses, *Rags to Riches* gives you a hint of what accounts you will need. The businesses covered run the gamut from bicycle shops to restaurants and are sure to make it easier for you to get started—you'll probably be able to modify and use one of the model charts provided.

In establishing your financial accounts, you must indicate to which account class each one belongs: Assets, Liabilities, Income, Expenses, or Net Worth. On a color monitor, each of these classes and its related accounts and transactions are presented in a common color. You can also assign to each account a subclass code (from 0 to 9), which will serve to group accounts in the financial statements.

To set up your accounts, you can input current, month-to-date, or year-to-date balances or start at zero. For initializing your accounts, this is helpful, but the ease with which you can subsequently alter these balances—with no discernible audit trail—may be of concern to you. It is of concern to us.

There's no budgeting capability or accompanying variance analysis showing the difference between budgeted and actual figures.

Transactional Analysis

Transactions are entered with one of five options: Deposit, to record a cash receipt; Check, to record a cash disbursement (via check); Money, to record a cash payment; Payable, to record an obligation due a vendor; and Transfer, to record a general journal entry.

As you enter a financial transaction (two accounts, an amount, and a memo description), the system reports the net result of the transaction in lay terms. For example, if you make a payment crediting cash and debiting expenses, the message will flash "+ Expenses."

The Audit command submenu options enable you to locate, correct, or reverse any transaction within a particular account. You can review these transactions by entering the account key. You can also print a detailed audit trail list of all current transactions. Again, the ease with which entries can be changed and reposted or reversed is appealing—as long as you take measures to ensure the control and the accuracy of these changes.

If you locate a transaction you know to be incorrect, you are able to freely modify

INDIVIDUAL TASTES

the information on display and post it. However, you would do well to reverse this incorrect entry before making any changes to the transaction. Otherwise you may alter the transaction, post it, and lose track of the original entry, which must still be reversed.

You can review your account balances at any time. Two fundamental accounting reports are available from the ledger module: the Chart of Accounts and the Audit Trail.

The Chart of Accounts (See Figure 2) is a listing organized by class and subclass with current balances, subtotals, and totals. It serves as your Income Statement and Balance Sheet and can be produced with the current, month-to-date, or year-to-date amounts. The Audit Trail is an audit trail listing for a particular account that will show all current transactions. You can also produce a transaction backup report, which shows the complete chronological detail for all the accounts in the General Ledger file.

Accounts Payable

With the Accounts Payable module, you can maintain vendor and invoice information, print checks, and produce several useful reports. In addition, the on-screen summary (the bottom half of the screen) displays instantaneous updates to and an aging for the vendor accounts you are affecting with your entries.

As with the General Ledger, accounts are set up (in this case for each vendor) through the Edit command series and are assigned a single-character ID. You can enter a vendor's name and address for use later in printing checks. You will also be prompted to input a phone number, a subclass grouping (again, 0 to 9 for ordinal grouping), payment terms, and a memo. The system will automatically accumulate, for each vendor, Y-T-D payments and purchases.

Figure 2: *The Rags to Riches General Ledger Chart of Accounts report. It functions as your balance sheet and profit/loss statement.*

The Bicycle Place Chart of Accounts

BALANCE SHEET		
ACCOUNT	CURRENT	PERCENTAGE
Asset		
c Petty Cash	75.00	0.4
k Checking Account	3,904.32	17.3
v Accounts Receivable	951.75	4.2
Subtotal 0	4,931.07	21.8
i Inventory	2,000.00	8.9
f Fixed Assets	15,652.93	69.3
a Other Assets	0.00	0.0
Total	22,584.00	100.0
Liability		
y Accounts Payable	1,202.26	9.2
q Equipment Loan	11,850.12	90.3
t Taxes Payable	0.00	0.0
Subtotal 1	11,850.12	90.3
m Company Credit Card (MasterCard)	73.70	0.6
Total	13,126.08	100.0
N/Worth		
p Proprietor's Account	0.00	0.0
Total	9,457.92	100.0
INCOME STATEMENT		
Income		
5 Sales/Service Revenues	1,500.00	100.0
x Other Income	0.00	0.0
Total	1,500.00	100.0
Expenses		
g Cost of Goods	0.00	0.0
o Office Supplies	27.02	6.1
r Rent	375.00	84.1
u Utilities	43.78	9.8
Subtotal 0	445.80	100.0
d Depreciation Expense	0.00	0.0
e Credit Card Fees	0.00	0.0
n Interest Expenses	0.00	0.0
z Other Expenses	0.00	0.0
TOTAL	445.80	100.0
Est. Profits	1,054.20	

The Bicycle Place
Account Master

ACCOUNT	CURRENT	PERCENTAGE
Media		
1 Cash	508.45	77.9
2 Check	10.00	1.5
Subtotal 0	518.45	79.4
3 House Charge	0.00	0.0
4 MasterCard	77.55	11.9
5 Visa	56.50	8.7
6 Diners Club	0.00	0.0
7 American Express	0.00	0.0
Subtotal 2	134.05	20.6
8 Mfg. Coupon	0.00	0.0
Total	652.50	100.0
Liability		
Tax 1 Collection	37.70	100.
Tax 2 Collections	0.00	0.0
Subtotal 0	37.70	100.0
Total	37.70	100.0
Transfer		
b Loans to Register	0.00	0.0
n Pickups from Register	0.00	0.0
Total	0.00	100.0
Sales		
a Bicycle Sales	519.90	83.2
d Accessories	59.90	9.6
g Miscellaneous	0.00	0.0
s Special Orders	0.00	0.0
Subtotal 0	579.80	92.8
f Parts	10.00	1.6
h Labor	35.00	5.6
Total	624.80	100.0
Discount		
x % Discount	0.00	0.0
z \$ Discount	10.00	100.0
c Store Coupon	0.00	0.0
Subtotal	10.00	100.0
TOTAL	10.00	100.0

As with the other modules, you use the Data command to enter all transactions. In the case of Accounts Payable, there are options to record invoices, manually prepared checks, and debit or credit memos adjusting vendor accounts. In each case, the transactions are recorded the instant you instruct the system to post them.

Each item on your vendor's invoice can be charged to a separate financial account if necessary and will thus be posted to individual corresponding accounts in the General Ledger when you merge your payables transactions into the ledger. Itemized entries are linked by a common invoice number so you can account separately for purchase subtotals, shipping charges, sales tax, and so on.

In entering invoices you may opt to specify a "print check" date. This is the one instance in which *Rags to Riches* will be sensitive to a date. If you don't wish to use the automatic check-writing feature, you can leave the date for printing the check blank.

But if you do use this feature, the automatic check-writing function will identify all amounts due for payment on or before the current system date and will print checks accordingly. Any two or more obligations due the same vendor will be combined onto a single check. Unfortunately, there's no opportunity to preview a listing of the checks selected for printing, and so you may end up having to void some checks. Further, the system does not list the checks that have been printed; it gives you only the checks themselves. As checks are processed, the system will automatically adjust the accounts to reflect the disbursements.

The payment function can be used to record your having paid, with a handwritten check, an obligation previously recorded as an amount due to a particular vendor. When you do so, you are asked to

Figure 3: The Account Master listing produced by the Sales module. It summarizes all your accounts, arranged by account class. This listing can be produced with the current month-to-date or year-to-date data.

INDIVIDUAL TASTES

enter the vendor and the invoice number. The updated (net) balance due for that particular invoice will be displayed on the bottom half of the screen. Debit and credit memo adjustments are entered in the same fashion.

To assist you in dealing with one-time-only vendors, the space bar on your keyboard is used to represent miscellaneous vendors. Vendor-specific information—the address, phone number, and the like—is left blank. However, if you enter the vendor name and mailing address in the memo field, the automatic check writer will use this information in printing the check. When entering transaction data for these vendors, use the space bar to bring up the Miscellaneous Vendors account. Enter the amounts, dates, and so on as usual.

As with the other modules, when you finish entering data in Accounts Payable, you can opt to post it, reverse it, or examine other payment transactions. There is no way to review a group of transactions and post them all as a batch.

Using the Audit command, you can examine all outstanding invoices for a specific vendor. When the command is first entered, the screen displays the last vendor examined. To examine a different vendor, you would simply press the appropriate vendor key. After reaching the right vendor, you can go one step further and examine the details of a specific invoice.

Reports available from this module include the Vendor List, a complete summary of vendor data; the Payables Aging Report, a report that lists all payables by individual vendor and by aging group (aging groups are 0-30, 30-60, 60-90, and 90+ days); and the Invoice Aging Report, the same report as above, but showing individual invoices with subtotals for each vendor and each subclass.

Accounts Receivable

The Accounts Receivable module works much like the Accounts Payable one. It is designed to maintain customer files; record billings, cash receipts, and

customer account adjustment transactions; and generate customer invoices. Customer files are created through the Edit commands and, as you might expect, are assigned a single keyboard character for identification purposes.

For each customer, you can enter the customer's name, address, phone number, and credit terms, a subclass for ordinal grouping (to, say, group customers by common credit term relationships), and a text memo. The system will automatically maintain balances for each customer's

The Sales module is designed to transform your PC into a point-of-sale register that handles change, figures taxes, and computes refunds.

year-to-date purchases and payments. The bottom half of the screen is dedicated to an aging report for a specific customer or for all customers.

Using the data function, you can record customer invoices, cash receipts, and credit or debit memo adjustments to customer accounts.

When entering or modifying customer invoice (billing) data, you can itemize specific line-item charges (for example, merchandise purchased, sales tax, and handling charges) and have these recorded against individual ledger accounts. Cash received in payment of a previously entered customer invoice can be recorded against that invoice, reducing its balance accordingly. Debit and credit memos can be used to adjust customer balances as well.

When a payment is received, you should record it against the appropriate

invoice. You can call up invoices to identify the one to which a payment applies. The system does not prevent you from inadvertently applying a payment against a nonexistent invoice number.

The Audit command series allows you to examine all the invoices and receipts for a particular customer and displays the resulting customer balance. Outstanding invoices for that customer are aged on the bottom of the screen. It's easy to picture an owner-manager telephoning a series of customers to encourage payment, all the while referring to the screen display of the transactions specific to that customer.

Before printing your customer invoices, you can examine them on your screen and can alter any as needed.

The following reports are produced by this module: the Customer List, a listing of all of the information pertaining to each customer; the Receivables Aging Report, a listing of all customers with outstanding invoice balances (balances are aged, and subclass groupings and subtotals are presented); the Invoice Aging Report, which is the same as above but shows individual invoices; and the Receivables Statement, a recap of the outstanding invoices for a particular customer.

Sales

The Sales module may be of particular interest to you if you're a retailer. It will assist you in accounting for and analyzing sales transaction data. Its developers have focused on the problem of recording sales transactions at the point of sale (that is, over-the-counter retail sales transactions). It's designed to be used in conjunction with an electronic cash box and to transform your PC into a point-of-sale register that handles change, figures taxes, accommodates various forms of payment, and computes refunds. This is not to say it cannot also be used by very small wholesalers.

The merge function enables you to combine transaction data recorded on various diskettes. This allows you to use several PCs in recording your point-of-sale

transactions and then merge this sales data from the various PCs into your general ledger.

The Sales module does more than record sales transactions. It helps you summarize how customer payments were made. The form of payment (cash, charge slip, or whatever) is recorded as you enter sales, returns, adjustments, and so forth.

Two financial reports are available from the Sales module: the Account Master Report (see Figure 3), a basic listing of all your Sales module accounts with current balances, totals by classifications, and percentages of those totals; and the Audit Trail, a list of all current transactions for a specific account, showing the transaction number, memo comment, transaction total, and account totals.

Installation and Documentation

Each of the four modules requires approximately 50K for the program files, and so all four modules would fit on one floppy. But disk space would become precious, and your backup procedures would become even more vital.

The documentation for each module is contained in a spiral-bound book of about 100 pages. We found a few inconsistencies in the index, and some of the exhibits were one or two steps ahead of or behind the narrative. But, on the whole, the documentation is adequate. A very helpful tutorial is included with each module. The command reference section is an excellent resource once you've become familiar with the system.

The *Rags to Riches* accounting software brings a unique spreadsheet-like approach to the task of keeping the books for a very small business. It would be too limiting for many small businesses needing a more formal, "traditional" accounting system. On the other hand, it does represent an alternative you might consider to keep account of your personal investments or to use in a very small business with a limited number of transactions and minimal reporting requirements.—G. William Dauphinas and Glen Selter

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Enable Does It Right



Offering true integration among all of its applications modules, Enable is everything Symphony hoped to be.

As with so many other buzzwords in business, the word *integration* has come to mean all things to all people. Manufacturers have been selling integrated packages for quite some time now; some of these packages, however, fall somewhat short of the ideal. For example, different applications may be packaged as one system but fail to share the same commands, the same screens, or even the same files.

Integration is important because most business documents use a combination of text, numbers, and graphics. The added expense of training people to use many different packages instead of one integrated package is enough to make integration cost-effective, all by itself.

Until now, though, there have been only a limited number of packages that offer true integration among applications. The best-known of these offerings, *Symphony*, by Lotus Development Corporation, has had mixed reviews. Critics of *Symphony* say it is not full-featured enough and not very easy to use. *Enable*, by The Software Group, may be the package *Symphony* was supposed to have been.

Enable offers four complete application packages, or modules, in one. Each module—word processing, spreadsheet/graphics, database/graphics, and telecommunications—could stand as a full-powered application in its own right. Together, they offer a powerful production tool that can serve everyone in the office, from data entry personnel to the vice-president of marketing.

Each module shares the same command structure and has additional commands for specialized functions. *Enable* offers full integration among the modules and relies on windows to achieve its integration. Spreadsheet cells, database records, and graphs can easily be copied into text files (see Figure 1), and database records can be copied into the spreadsheet cells. You can easily put up to eight win-





dows on the screen at once. *Enable* is sleek, too. The package comes on three disks, one of which is the tutorial. The code is compact as well, and the action is fast. The program runs on a standard PC with 192K RAM.

Fitting the Pieces

The key to *Enable's* speed and functionality lies in the Master Control Module (MCM), the layer above DOS that supervises all activity in the program and isolates the user from the operating system. Since the MCM performs certain operations faster than DOS, the elimination of this overhead contributes to *Enable's* speed.

The MCM contains all the common application functions so the applications are not encumbered with redundant code. This means you need less RAM, both for each module and in order to run the product as a whole. It also allows more work to be done in RAM, avoiding relatively slow disk access tasks that degrade performance. *Enable's* speed and efficiency also owe something to the fact that the entire program is written in assembler language.

The MCM easily handles hardware interrupts as well as scheduling tasks and events. It can handle interrupts for complicated spreadsheet calculations while capturing incoming information from the telecommunications module. More significantly, the MCM was designed from the outset to handle multiple users simultaneously performing multiple tasks. The MCM is your sole interface to the pro-



Enable

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Requires: 192K RAM, two disk drives,
graphics adapter, DOS 2.0 or 2.1.

CIRCLE 787 ON READER SERVICE CARD

gram, whether you input through the keyboard or by way of the telecommunications module.

Specifically, the MCM is in charge of windowing, file management, macros, and profiles (system-wide, user-defined configuration specifications). You can work on three different applications concurrently.

Using the profiles, you can configure certain of the system's default aspects, such as hardware, modem settings, page size, margins, and whether or not to create back-up files. You may use the standard profile or create your own.

Enable opens with a sign-on screen, where you can enter the date, time, and name of the profile you wish to use. Next, the main menu appears (see Figure 2). You choose the "use system" option to proceed to the various applications. Each application allows command entry using a top-line menu that appears after the F10 key is pressed. Most commands can also be entered by pressing a series of two to three keystrokes, called expert commands. All expert commands are invoked with the F9 key. Beginners may start with menus, but as they gain familiarity with the program, they can switch to expert commands.

Although *Enable*'s command structure is, for the most part, logical and easy to follow, the sheer size and power of the system could intimidate novices. However, at least one computer dealer thinks that *Enable*'s primary selling feature is that it's easy to use. It may seem as complex as *WordStar* at first, but once you learn the basic commands, you can immediately use all the application programs.

Enable has some slick touches, such as the ability to use files from other programs. A *WordStar* file read into *Enable*'s word processor, for example, keeps its bold and underline attributes, although some esoteric *MailMerge* dot commands are not translated. You also can use files from *dBASE II*, *1-2-3*, *VisiCalc*, *Volks-writer*, and *EasyWriter*.

Each of the full-featured *Enable* appli-



Figure 1: *Enable* allows you to paste graphs and spreadsheet files directly into a word processing file.

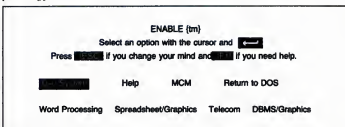


Figure 2: *Enable*'s Main Menu lets you choose which type of application window you wish to open.

cations deserves its own review, but there is room here only for a quick overview of how the modules interact and a description of some of their unique features.

The Word Processor

Enable's word processor offers just about everything you could ask for. The top-line menu, invoked by pressing F10, offers options for many functions, including inserting headers and footers, copying text, deleting text, search and replace, printing, saving, and access to the Master Control Module. Many of these commands can be entered by pressing the F9 expert command key followed by a one- or two-keystroke sequence.

With just a few commands, you can copy spreadsheet, database, or graphic information into your text document. You can work on two different text files simultaneously, and *Enable*'s windowing system makes the process easy. Document size is limited only by disk space.

Enable does not change data dynamically. For example, changing spreadsheet data in one window, does not alter the spreadsheet data you have copied in a text file.

The word processor is rich with commands—inevitable in a program so full of features. However, because the command structure is similar to other modules, it doesn't take long to learn to work quickly.

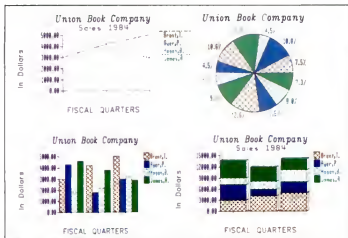


Figure 3: Enable can create vertical bar charts, pie charts, and line charts. These were output to a Hewlett-Packard plotter.

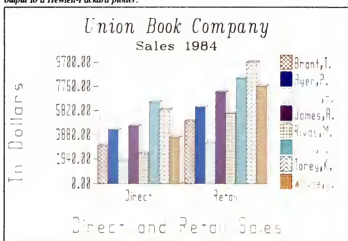


Figure 4: Classy-looking three-dimensional bar graphs are a standard option.

In fact, this article was written using *Enable*, which involved a tearful abandonment of the time-honored *WordStar*.

Print attributes are assigned by pressing the Alt key plus a letter key, such as B for bold or U for underlining. Most attributes are displayed on the screen. Bold type looks bold and doesn't have any extra control characters cluttering up the screen the

way *WordStar* does. *Enable* supports almost 20 different printers, including the Hewlett-Packard LaserJet and the NEC Spinwriter. It also supports different Hewlett-Packard plotters.

Enable's word processor offers some valuable features that help to produce long, complex documents. Automatic footnoting is available, along with options

for footnotes at the end of each page or the end of the document. "Paper clip" markers can mark spots in your text. You can also insert comments that will not appear in your final printout. Letters can be merged with files from the database for producing mass mailings.

The menus provide for another exciting feature, which is not yet available. Automatic generation of an index and a table of contents is planned for the first update, to be released in February 1985.

Spreadsheet/Graphics

Enable's spreadsheet offers a 255-row by 255-column work space. The command structure is similar to that of 1-2-3, but a main difference is that *Enable's* graphs are considerably easier to print out. A few keystrokes do the trick, and disk-swapping is unnecessary.

Enable includes most typical spreadsheet features, such as the ability to name ranges, to print headers and footers, and to combine spreadsheets. Common mathematical and financial functions are available, including +PMT (payment per period), +PV (present value of an annuity), and +IRR (internal rate of return). Fields from database records can be copied into the spreadsheet area, and the spreadsheet automatically adjusts the format of the cells to match the format of the information copied from the database.

You obtain the graphing function by choosing the Graph command from the top-line menu, which leads to a series of other prompts. You can create vertical bar charts, pie charts, and line graphs (see Figure 3). While you cannot graph horizontal bar charts, the vertical bar chart menu offers the option of producing three-dimensional bars, which gives charts a classy look (see Figure 4). Alas, you cannot access the graphing function using the expert commands; you can only do so through the menu.

The DataBase/Graphics Module

You may be thinking that the DBMS must be *Enable's* Achilles' heel. After all,

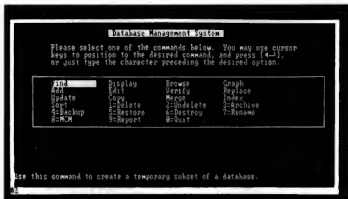


Figure 5: The opening menu of the Database module.

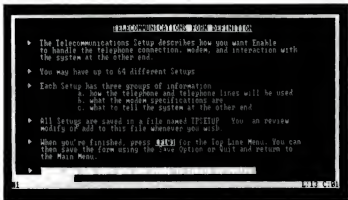


Figure 6: The opening menu of the Telecommunications module.

databases are often the weakest link in other integrated packages, right? Wrong. *Enable's* DBMS is a powerful, flexible system that can handle up to 130 megabytes of information.

The opening menu (see Figure 5) displays the basic functions needed for creating, maintaining, and using a database. During the process of database and report definition, only the database window can be open.

The DBMS module allows you to define each field in a database by prompting you with questions about the data to be entered (text or numeric, for example). Many questions are answered with a single

keystroke. Each record can contain up to 32 fields, or up to 113 derived fields or fields input from another database within *Enable*. Each record, however, is limited to 2,000 characters.

Once you have defined a database, you then can design the data input form. The simple process involves using the arrow key to position the cursor where you want the field to show. *Enable's* manual refers to this command as the "put it here" command. This title is perfectly appropriate, and it turns the designing of forms into the visual process it was always meant to be.

Once you've established a database and

printed the records, you have the option to display, sort, or print them by entering field names and a logical relationship. Mathematical operators (records where the field "city"=Miami, for example) or Boolean operators such as "and" and "or" may be used.

Enable's DBMS has a powerful report-writing capability. As in the input form design, you can design the report form with the "put it here" command followed by the name of the field to be printed in that location. You can use a report language that includes such commands as "if" and "else" to create more detailed reports.

The same graphics options available with the spreadsheet can be used with a database. The system prompts you to choose which data fields you want graphed. It's as easy as, well, 1-2-3!

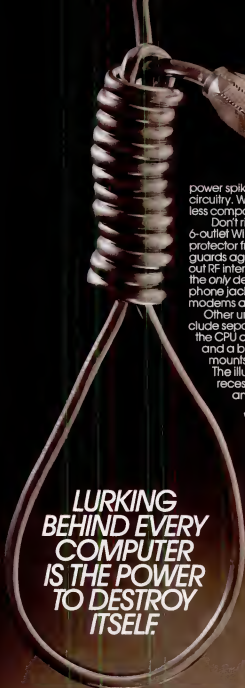
Telecommunications

The telecommunications module works fine. It easily downloaded stock quotations from CompuServe. The telecommunications parameters are easy to enter, and you only have to define the steps for a call and log-in once. You can store up to 64 different "set-ups" (see Figure 6).

The program is extremely straightforward to operate—you just follow a series of prompts. The documentation includes general information on telecommunications so that new users should have little difficulty with the program.

Summary

The Software Group clearly has a winner on its hands. *Enable* must be considered second-generation because it is more evolved, slicker (seamless, some would say), and faster than anything else on the market. Users of other products need not abandon camp, but *Enable* undoubtedly will affect the future sales of its competition. And yes, you guessed it: a multi-user, multi-tasking version of *Enable* should appear soon, along with a version that will run under XENIX and other operating systems.



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CIRCLE 454 ON READER SERVICE CARD

Special-effects master Robert Hollander and others use the PC and AT to create futuristic graphics for 2010 and other films.

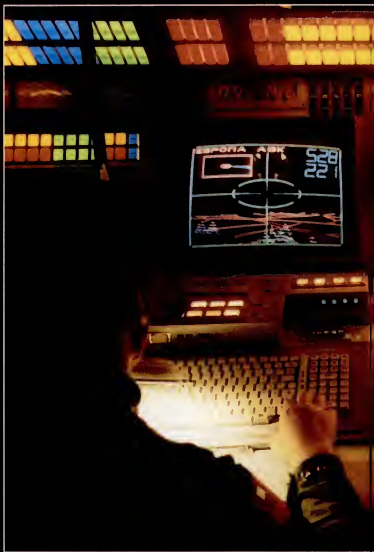
A starship zooms past a distant sun. A 12-foot salamander marches ponderously across a desert in space. A three-dimensional head revolves on a 360-degree axis. In the vast realms of the science fiction film, a great deal, if not most, of the filmmaker's emphasis is on special effects, or SFX—the camera tricks that help the audience suspend disbelief and enter the fantasy world onscreen.

Most of these effects are produced with highly sophisticated, and highly expensive, mainframe computer systems. However, two innovative experts in special effects have now developed PC-based systems that create sophisticated graphics and motion-control effects for the silver screen.

Futuristic Graphics

In *2010*, the sequel to the classic science fiction film *2001: A Space Odyssey*, graphics experts produced background effects using a very down-to-earth IBM PC system.

In *2010*, U.S. and Soviet astronauts are sent to investigate the fate of the



2010: A PC



ODYSSEY

ship lost in 2001. A multitude of on-board monitors flicker with animated computer graphics that depict segmented spaceships, mysterious black slabs, and human heads being examined (presumably) by the ship's scanners. These computer graphics are the creations of Video Image, a small, Los Angeles-based special-effects company. And, according to one of the general partners, Richard E. Hollander, 35 percent of them were created with a PC.

"Lots of people ask, 'Why did you choose a PC?'" muses Hollander in his Marina del Rey studio. "'Why didn't you use a VAX?'" The obvious reason was money, and the fact was we didn't have to have high-resolution graphics for this production. With the volume of production and the type of contract we were getting into, I felt we needed two machines in case one broke. The PC fit the bill."

Hollander, who has a degree in electrical engineering and computer programming from Berkeley, had worked on such movies as *The China Syndrome* and *Star Trek—The Motion Picture*. When the bidding for the video effects for MGM's new film came up, he formed Video Image to try for the job. The new company included John C. Walsh, whose background is in art, along with Gregory L. McMurry and Rhonda C. Gunner, both video editing and electronics specialists.

"We probably got the contract because we were able to provide all the art direction and the technical support as a single company," Hollander says. "The way it worked was that the director, Peter Hyams, first talked to Gregory, who gave the information to John and myself. We created the imagery back at the office, and Greg and Rhonda went on the set to play back the imagery we had created. That kind of vertical integration in a project, especially one like *2010*, makes it go really smoothly for the director." He smiles. "It makes it nice for us, too."

Video Image uses two identical PC-based systems consisting of an IBM PC (one with a 10-megabyte and one with a 15-megabyte Davong hard disk), a float-

ing-point math processor, a Cubicomp CS-5 Solid Modeling System, a backup PC unit with a 15-megabyte hard disk, a GPCO 20-inch by 20-inch digitizing tablet, and a 19-inch monitor.

2010

In the motion picture *2010*, graphics experts produced background effects using a very down-to-earth PC system.

Originally, Hollander used a Cromemco System 2 CP/M computer system for the less-sophisticated graphics production

on *2010*. But he found that the CP/M computer had distinct limitations.

"I felt that the PCs gave me a lot more power than I would have had with the Cromemco. And the Cubicomp gave me a base of 3-D image creation. The day I got it, I started digitizing some models into the system. That's a lot of work.

"When I bought the Cubicomp, I was not looking for only a piece of hardware. I was looking for a piece of hardware combined with a piece of software. Software costs much more than hardware, especially in the area of 3-D graphics, and if you don't have decent software, you can't do anything when you get a new piece of hardware. It's an old rule for mainframes, and it holds just as well for PCs."

Video Image's PC systems use three basic pieces of software. The first two are Cubicomp's CS-5 Solid Modeling System and Time Arts's Easel. But these two alone didn't fill the studio's needs.

"We needed to move objects around in



Examples of animated graphics from background monitors in the movie *2010*.
Right: A simulation of the surface of the moon Europa. *Below:* An analysis of the monolith on Jupiter.
Left: The Europa probe.



МОНОЛИТ

A Head for Digitizing

Video Image's Richard Hollander offers some insight into the detail work of filmdom's SFX artists.

The graphics Video Image created for *2010* were not quite as simple to produce as a pie chart or a bar graph. While the PC/Cubicom system can work up some highly sophisticated graphics, producing the type of image suitable for the movie screen required a little imagination.

In one animated sequence, for example, a three-dimensional human head turns on the screen as the computer scans it. To get the proportions on screen, Richard Hollander digitized a styrofoam model of a head into the PC.

Unfortunately, though the head was in the appropriate three dimensions, Video Image's digitizing tablet worked only in two. "We could have sliced up the head," explained Hollander. "Then, on the tablet we would have traced out the perimeter of each of the slices."

But they actually mounted the head sideways on a piece of wood (since the head was symmetrical, they digitized

only half of it) and put it on a milling machine.

Video Image replaced the machine's biting tool with a needle so they could point the machine to various parts of the head. Meanwhile, staff member Peggy Weil drew triangles on the head surface, concentrating on areas that would well define the head and give detail around the more difficult regions, such as the eyes. She numbered each triangle and intersection.

Once they mounted the head on the milling machine, Weil moved the head around. As the needle pointed at each vertex, she checked the coordinates of that point's height, width, and depth as they appeared on the machine's dials (to about a thousandth of an inch) and called them off to staffer Steve Eagle.

Hollander then wrote

three programs to accommodate the new data: one input the coordinates into a database, another defined the various polygons, and a third input the list of vertices and the list of polygon definitions into a Cubicom database. "The numbers as read were in inches," Hollander recalled, "and I scaled them out to something that was more appropriate for the number system in the Cubicom." He laughed. "There was some error in the number input—we ended up with a head that had a lip sticking out a million miles!"

After making the necessary adjustments, they copied the one side, putting it on the other side, to create a full head. But that was only the beginning of that sequence. The staff then had to put the image on the video screen, plan an animation, and write a script describing the individual sequences.

The final sequence has a border and an inner window, while the head slowly spins. "Each polygon across the face fluctuates, using color map animation," explained Hollander. "And all the final commands and all the sequencing of letters and numbers that appear on the screen are done on the animation system. I'd do the 3-D imagery first, film that, rewind the camera, and do the 2-D stuff on the second pass."

— B.K.

A video image staffer advises that the hat is optional.



space, and to do quite a few other things, and we had to write some support programs to interface to those two packages. We call our support software HAL," Hollander says, grinning (HAL is the name of the computer featured in both *2001* and *2010*). Hollander wrote HAL using Lattice C. Along with the improved facilities came a few frustrations, Hollander explained. "At that time, HAL didn't support the full address space of the processor, which was a severe nuisance, but using an overlay linker called pLink helped us get around part of that problem. Then Lattice C came out with full point conversion, and we suffered again because the floating-point processor software that we had did not do everything we needed.

"You can't do computer graphics without a floating-point accelerator," Hollander said. He then paused for a moment before correcting himself. "I should say, you can do anything you want—it just takes a long time."

Hollander's software, a modular overlay, which is structured to line up applications programs as they become necessary, forms the basis of many of the company's animation tools.

"We use a 3-D animation system to give coordinates for axes of movement. Our paint program, which has color map manipulation animation capabilities, is very important too. We also use a typesetting program. And we have programs that smooth out curves, an object interpolator that changes the shapes of objects as well as squeezing, rotating, and distorting them. . . . It never ends. The program grows every time we do a project because there's just so many different things you can do with computer animation."

Artistic Freedom

The Video Image crew had a lot of artistic freedom over what they could create for *2010*'s video monitor sequences. "There was feedback between John Walsh and director Peter Hyams all the time," says Hollander. "We would make

a Polaroid off the screen and attach it to the sheet showing the animation sequence. Then John would take that in to Peter, and talk, and Peter would say yes or no.

"Sometimes Peter wouldn't see an image until the day it appeared on the set. That's when Rhonda and Greg would save the day—if something wasn't exactly what Peter wanted, and if it could be manipulated with an effects generator or by editing, they would step in and take care of it."

Once the video animation had been completed, it went through an elaborate



At the time of the revolutionary film *Star Wars*, computers became an integral part of the motion-control process.

sequence of filming and refilming to suit the footage to the motion picture camera. As Hollander explains, "Everything always went from the video tube to film, back to video tape, back to the monitor, and then it finally got shot with the camera. Greg made his own box that takes the sync information from the camera and jams the video equipment so that it plays back at the appropriate frequency and the appropriate phase. This rids the film of any of the artifacts (irregularities) that are typically found if you don't synchronize frequencies."

Now that *2010* is a reality, the Video Image crew is using its PCs for other projects, including a 20th Century Fox

film called *Bio Hazard*. Hollander is thinking hard about using the PC AT, but even that will not satisfy his need for fast, sophisticated graphics.

"The AT is a whole new ball game," he says. "And I imagine in another 2 years there will be something to quadruple the capability of the AT." He smiled. "That'll be nice."

Moving Along

"I've done what a lot of computer entrepreneurs have done," explains Bill Tondreau, "which is to capitalize on some previous occupational knowledge. In my case, it was how computers worked."

Tondreau is a photographer who has spent the last few years developing computerized motion-control devices—machines that, by moving a camera around an object, make it appear as if the object is moving instead. Most recently, he has created a PC-based system that produces highly detailed photographic effects.

Until recently, motion control was effected with hand-operated camera stands that would vary the camera's tilt, up-and-down movements, and side-to-side movements. However, these hand-operated stands put severe limitations on technique; in fact, if computers had not come into the picture, most of today's special effects would not be possible. "It's doubtful that I take out of 20 would have turned out properly," Bill says. "Every act would have had to have been in exactly the right place at the right time."

Around the time of the revolutionary film *Star Wars*, computers became an integral part of the motion-control process. By using computer-driven machinery to move the film camera, small, elaborate models could be photographed in a way that make them seem extraordinarily realistic. These systems were, of course, extremely expensive, and Tondreau was soon experimenting with much smaller computers that used the Z80 microprocessor.

"Most older motion-control systems use stepper motors," he explains, "which have a resolution of 400 discrete positions

for each turn of the motor shaft. But partly because of the limitations of the Z80 CPUs, and partly because of the limitations of the stepper motor drives, a great deal of noise was generated, the resolution was a little coarse, and the velocities you could reach were rather low.

"Normally, when filming a live action scene you shoot at 24 frames per second while controlling about 12 different motors. In the days of *Star Wars* and some of the older special-effects features that put motion control on the map, shooting at 1 or 2 frames per second was sufficient. But now it's becoming more desirable to incorporate motion-control-type effects with live action. This means you've got to run through these moves really fast, really accurately, with motor velocities that are faster than before.

"But whereas the old Z80s were just about at their absolute limit at 24 frames per second, the IBM PC is just loping along at that rate. Whether because of architectural characteristics in the circuitry or the way the interrupt controller can be reconfigured, you can run through moves at several hundred frames per second. So the PC has taken motion control from running on the ragged edge to doing everything you always wanted easily.

"Also the Z80 chip with its 64K just can't hold the move data. If you're making, say, a minute-long move using 12 motors, you'd have to maintain long lists of numbers of positions in computer memory. The 64K of the Z80 is pretty spare in that respect. But with the 512K on the PC and the 3 megabytes or so on the new AT, you are no longer limited in sophistication of the program or the length of move you can store."

Better Effects with the AT

In fact, Tondreau has already abandoned the PC for the AT. "It's a little more expensive than the PC, but in the world of commercial and film effects, it's false economy not to go for the best," he says. "The PC is totally acceptable, but the AT is significantly faster."

To adapt the AT for motion control, Tondreau devised his own proprietary memory board that contains chips that control six individual motors. Since the AT can hold five of the boards, the computer can control 30 separate axes of motion simultaneously.

Tondreau wrote a program in C and assembly language to accompany his hardware and help the computer direct and keep track of the motion-control equip-



"The AT is a little more expensive, than the PC, but in the world of commercial and film effects, it's really false economy not to go for the best."

ment. "It's a C86 compiler," he explains, "and we're using the math chip, which makes the thing run incredibly fast."

The fully equipped microcomputer can guide a user through the elaborate and exacting movements of motion control. "Suppose I'm working on a simple back-and-forth movement," Tondreau says. "At frame 1, I want the camera to be negative 40 inches from the object, at frame 50 I want the camera 20 inches from the object, and at frame 100 I want it 0 inches from the object. I type in these three positions. The computer then uses a splining algorithm to do a complete frame count." In other words, once the operator has given the AT the most important points to which the camera is supposed to travel, the

program fills in all the intermediate directions.

You can also direct the computer by manipulating the camera physically. Plugging a specially rigged camera stand into the AT enables the operator to tell the computer to capture, remember, and repeat each movement that's made. You also have a choice of outputs—either by following the actual movements of the camera (Tondreau uses a video camera mounted on the motion-control apparatus so that he can watch each movement as it occurs) or through a simple graphics playback on the PC monitor.

Repeatability Factor

The "repeatability" factor may be the PC's most important contribution to motion control. Tom Barron, a master effects cameraman who works with Robert Abel and Associates, a commercial production house, asserts that "the idea of repeatability, and the idea that Tondreau's machine is able to repeat with a very high degree of accuracy, is our primary concern. Once we know and can trust a system's repeatability, we can press for speed, number of channels, ease of operation, good looks, low power requirements, less cables to trip over, all those other things. But if it didn't repeat, it would be practically worthless."

Barron cites an example in which his staff had to shoot a time-lapse show of a cake rising. "We wanted to do a camera move while we were doing the time lapse photography. So we set up Bill's system with a mechanical rig that moved the camera, and he wrote a program that turned on the camera and took an exposure, based on one of the channels of movement. We actually did an ease-out of real time versus cake-baking time, so that the camera took fewer exposures at the beginning when the cake was cold and not rising, and more exposures at the end where the cake was active and browning. So when you look at the sequence, you get a linear sense of the cake rising, and it looks just wonderful. But, in fact, those exposures were spread

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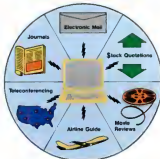
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2010

over time in a very unique way. In most cases, you use the camera shutter speed as the channel around which everything else is synchronized. In this case, we used the cake."

And Barron agrees with Richard Hollander's estimation of the economic advantages of the PC. "We basically work under battlefield conditions," he explains. "We're always running machines to the limit, and so we need to have a good,



"We basically work under battlefield conditions. We're always running machines to the limit, so we need good equipment like the PC."

dependable piece of equipment like the PC upon which to base the system. Quality hardware has always been one of our most important needs."

Meanwhile, Tondreau's entrepreneurial efforts has successfully established him as a one-man production company, developing and assembling motion-control systems for production companies like the one Barron works with as well as for most of the major film studios. He recently sold his new AT system to Industrial Light and Magic, the special-effects house established by George Lucas, producer and director of *Star Wars*.

"I'm absolutely using only the PC," Tondreau declares. "It's such a good, advantageous basis for my work." ■

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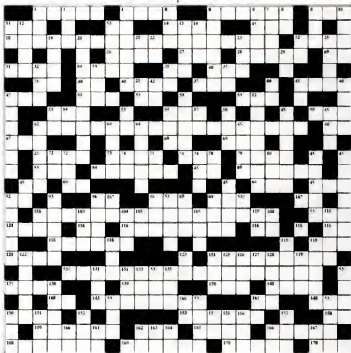
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1. A widely used code representing alphanumeric characters. (Hint: If you're given an "e" for effort at doing this puzzle, your computer will have to give a "1000101.")
3. Bits per second, approximately.
5. Artificial intelligence pioneer Alan.
9. Hollywood computer.
11. WordStar command to move cursor to previous position after saving text.
13. "Eliza" is an example of this field.
14. Assert.
17. Kind of switch. Also, synonym in certain parts of the country for *nerd*.
18. Host Ed, actor Paul, and Bishop.
24. Epson printer.
26. — General (*Soul of a New Machine* locale).
27. Display used on keyboards and printers.
28. What hard-core hackers (disparagingly) and documentation writers (impersonally) call the rest of us computer owners.
30. — cit.
31. BASIC statements that serve to clarify information for humans, but that the computer couldn't care less about.
33. Spell
35. "— Shall Overcome."
36. Paddle.
38. Silicon Valley firm famed for its scientific computers.
39. Initials of science fiction author who writes a book a month on his TRS-80 and who was the first to suggest that the first law for robots is never to harm a human.
40. Ivy League university with leading artificial intelligence program.
43. What to see in your Chevrolet.
45. Apple microprocessor.
47. Garage mechanic turned guru, now rumored to be turning to politics (nickname).
48. Main chip.
49. The U.S. institution that's slower than Source Mail (abbr.).
51. Flat-screen display technology.
53. ALGOL's original name.
56. Eight of these make a byte.
60. Another name for the Starwriter of Printmaster letter-quality printer distributed by Leading Edge.
62. Solitary song of an oxlike African antelope with a nasty disposition.
66. The two numbers a computer knows.
67. Atari chief scientist (formerly top honcho at Xerox PARC).
68. CompuServe menu command.
69. Leo Darocher's nickname.
70. Send data into storage.
73. BASIC command, or something to take with

- you to the CompuStore.
76. "If I — a hammer . . ."
 79. \$10,000 Apple and/or object of custody suit.
 83. Weird.
 84. "An offer you can't —"
 85. Magazine catering to IBM owners.
 86. Computerease for *laser*.
 87. Initials of software firm that sells WordStar.
 88. — Solver.
 90. Proofreaders' dashes.
 91. How you feel when your system crashes.
 92. Initials of the man who invented Microsoft BASIC.
 94. Marketing field.
 96. Trendy.
 99. Pac—.
 101. Lobster land (abbr.).

102. Naked serviceman's foot bottom.
109. The — of Physics.
111. Common bus (computer variety).
112. Trnsp'n.
113. Branch of computer science that's turning out factory workers.
114. King of Comedy actor (initials).
115. Average computer language.
116. Loyola University letters.
117. Seymour Papert's favorite animal.
120. Asian holiday.
121. Kind of semiconductor technology, often found in portables.
124. New catchword used to describe hardware or furniture designed with the human-machine interface in mind.
130. Levi's belonging to earthling who does not have sex.
137. What Bette Davis would call a computer



Crossword

Give it a try, but don't let the numbers fool you.

screen printout.

139. Goddess.
140. Ref.
141. Otherwise retrograde film that was the first to use computer graphics.
142. Former.
143. An absurd set of rules governing diplomatic relations. In addition, an equally arcane set of rules governing the formats of messages to be exchanged by computers and peripherals.
147. Letter addendum.
148. "_____ the season to be jolly."
150. Beta _____ site.
153. The portable computer that's giving Adam Osborne some sleepless nights.
158. Region of the United States where famous Route 128 is located (abbr.).
159. Kind of access.
162. Apple product.
163. Greek letter. Also, what you don't care one of if you never touch a typewriter again.
166. IBM PC operating system.
168. Algebraic notation system. (Also, adjective referring to college cheers emanating from 40 across.)
169. Author who's taken some kidding in this puzzle.
170. 400 or 800.
171. Telecommunications command.

DOWN

1. A programming language with a truly ho-hum name.
2. Acronym for the use of computers in classroom teaching.
3. Having only two possible states.
4. Beaver construction.
5. Radio Shack operating system.
6. Fifteenth.
7. Screen size in inches of 153 across.
8. Family doctor.
9. Numbering system having a base of 16 (abbr.). Also, what you might like to put on certain software designers.
10. Closed sequence of instructions in BASIC, especially in Chicago.
11. Keyboard instruction on many computers to freeze scrolling text.
12. Sprint printer manufacturer.
13. A wing _____ prayer.
15. Sunny _____, in Silicon Valley.
16. Wind direction, if the wind is blowing from Radio Shack corporate headquarters to Wang Laboratories, Inc.
19. Artificial intelligence language or actual speech defect.
20. Calcified.

21. The Extraterrestrial.
22. Home state of Microsoft (abbr.).
23. Continent (abbr.).
24. Salutation for a fem.
25. Intel 8-bit chip.
29. The microstate (abbr.).
32. Measurement in millions of cycles per second.
34. Astaire's forte.
35. Us festival-goers?
37. Organization of problem drinkers.
41. Wire service on CompuServe.
42. _____ and behold!
44. 8 down, for instance.
45. Fairly standard computer memory configuration, in K.
46. Movie starring 9 across.
47. *Star Wars* denizen.
50. ProWriter printer manufacturer.
52. To prepare a machine-language program from a program written in a high-level language.
53. Input/output.
54. Capone.
55. Home of Carnegie-Mellon (abbr.).
56. Mistake in a program.
57. Ordinal suffix.
58. Transistor-transistor logic.
59. Health foods (nonhacker fare).
61. Bell _____ modem protocol.
62. CompuServe on-line helper.
63. Related data on a disk, or something to put in a jailhouse cake.
64. Another BASIC command.
65. Dress-for-success tie or blouse material.
71. Commercial.
72. Monitor.
74. _____-THEN-ELSE.
75. Eliot. Or what to say when someone tells you it's their turn at the arcade.
77. Throwback character in 46 down.
78. Capital city initials.
80. Total.
81. The key on the Apple that people constantly press by mistake, which causes them to lose all their data.
82. Silicon Valley hardware executive Bill.
87. Sports car, or initials of Morrow exec.
89. Red planet.
92. Programming language invented at Dartmouth and transported to micros on the MIT's Altair.
93. Starts the computer.
94. Serial, parallel, or girl in every.
95. _____ modulator. Also, initials of one of the creators of VisiCalc.
96. Nickname for Boston. Also, the ring at the center of a floppy disk.
97. False god.

98. Cuddly, fuzzy, Commodore computer.
99. Big _____.
100. "Neither" in Nicc.
102. Therefore.
103. Computer operator goof (abbr.).
104. _____ you kidding?
105. Negative.
106. Leading technological university.
107. Home state of Stevens Institute of Technology (abbr.).
108. Overhead train.
110. Actor Guinness.
118. Lines per inch.
119. Creature who runs amok in the computer game *Pig Pen*.
120. Opposite of 148 across.
122. Device that allows middle-aged male executives who never learned to type to be part of the computer age.
123. Home state of CompuServe (abbr.).
124. Ostrichlike Australian bird.
125. Available memory.
126. Gross national product.
127. Football's Simpson.
128. Multiuser computer setups.
129. J, K, I, _____.
131. Where you can put a detachable keyboard if you're so inclined.
132. _____ degradable.
133. Firm that makes add-on boards for the IBM PC.
134. What Cine Snelair is probably called in Spain.
135. The computer's panic button.
136. D _____ II.
138. Part of a daisy wheel?
144. Permanent memory.
145. BASIC prompt.
146. Den (where the pirate or the green snakes lives in *Adventure*).
147. Italian river.
149. _____ many words.
150. Actor Hunter, or column feature.
151. Box office sign.
152. Lady Lovelace (first programmer; also daughter of Lord Byron).
154. _____ ho ho!
155. School org.
156. Quick and dirty version of 122 down?
157. Something that's smaller than VLSI, but bigger than MSI.
160. _____ plus ultra.
161. Binary state.
162. 3.14159265, approximately.
163. Driver's license, for instance.
164. What is the name of TV's famous talking horse.
166. Title of TV's talking horse.
167. Steer.

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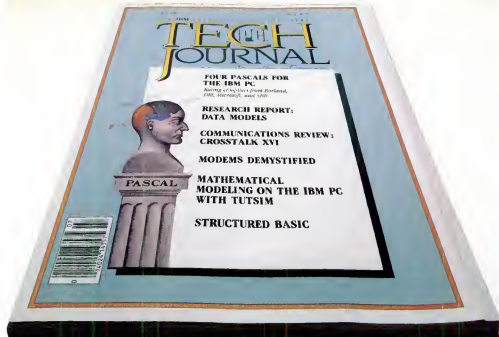
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Oxford (äks'ferd) Goes On-Line

As the editors of the huge and authoritative Oxford English Dictionary put all 17 volumes on-line, IBM is providing funds and PCs for the project.

The venerable though ponderous *Oxford English Dictionary* may be the last word on the English language—but it's certainly not the latest. This scholarly dictionary illustrates the history of the word *computer* with quotations dating from 1897 to 1970. Its most recent entry, however, is from almost 10 years before the microcomputer arrived to take data processing away from the mysterious mainframe and put it right in front of everyone's nose.

Don't blame the scholars at the Oxford University Press for the oversight. Print is, by nature, susceptible to chronic obsolescence; it's simply too expensive to update books for every scientific and technological change. But now, the publishers of the *Oxford English Dictionary* have announced a plan for keeping up with the times: all 17 volumes of the *OED*—as this encyclopedic dictionary is known to its admirers—are going on-line. IBM is financing a big chunk of the project, and, as a result, project managers expect the IBM PC to play a major role in digitizing the *OED*'s definitions.



A Greater Market

Oxford University Press expects to publish an integrated edition of the dictionary in book form at the end of 1987 and to put it on-line in 1988, making this bulky reference work more widely available and more easily accessible than ever before. "People will be able to subscribe to it," says Tim Benbow, manager of the *New Oxford English Dictionary* project at Oxford University.

(Illustration: Bill Russell)

covered only the words from *A* to *Ant*. The word *computer* made its first appearance in an 1897 entry that described a "certain circular slide rule" invented by Mr. W. Cox. It took the editors 44 years to reach the end of the alphabet, with the publication of the final volume in 1928.

Those weighty 13 volumes survey the words that have made up the English language since the middle of the twelfth century, including all those that dropped out of use along the way. More than 400,000 words are examined in detail, covering 16,570 pages. The use of each word (and each variant definition) is illustrated with literary allusions by date—more than 2 million quotations in all.

The result is a unique historical dictionary that tells you exactly when a word appeared and when its meanings changed. It has become an indispensable resource for scholars, who use it to find out, for instance, all the possible connotations of a Shakespearean soliloquy.

Even more remarkable than the sheer size and ambition of the original *OED* were the indefatigable efforts of its first editor, James Murray. The self-educated son of a Scottish tailor, Murray began his work with a small band of assistants in a shed in his London garden. Although he died in 1915, Murray personally edited nearly half of the definitions in the complete 1928 edition.

An On-line Update

The *OED* is not frozen in 1928. Knowing that a living language continues to grow with new words and usages, the Oxford University Press dedicated itself to combining the traditional and the contemporary in its master lexicon. Supplementary volumes began to appear 12 years ago, recording words that have appeared since the 1920s. The fourth and final supplement will be published in 1985.

Integrating the four *Supplements* into the main body of the text is one of the major goals of the *New Oxford English Dictionary*. The work will be done on an IBM 4341 mainframe (donated by IBM

United Kingdom, Ltd.) along with tape and disk storage units, printers, and more than 20 terminals.

Before the computerized editing can

begin, however, the existing edition must be keyed in. The editors have handed that daunting task to the International Computer Corporation in Fort Washington,

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Pennsylvania, where 120 keyboard operators are currently pounding out the millions of words that make up the text. The many fonts and symbols used in the dic-

tionary would dumbfound a mechanical character reader, and so the entire input will rely on human, CRT-bound scribes. To make the text accessible to machine

searches, each element of every entry—pronunciation, etymology, definitions, and quotations—are being coded.

"We're trying to ensure that the integration is as automatic as possible," says Benbow, explaining that the process is not as easy as it might seem. Some entries in the *Supplements* are wholly new and need only be inserted between two other words in the main volumes. Other entries in the *Supplements* are lists of auxiliary definitions and subdefinitions.

While much of the *NOED* project is still in the development stage, it is certain that at least three IBM 3290 terminals will assist with the test-integration process. The terminals have a windowing ability that will allow editors to put two documents on the screen next to each other, which will make it easier to combine the texts. With software designed to handle a good deal of the integration automatically, Benbow hopes "editor intervention" will be modest and that three workstations will prove sufficient. PC 3270s may be employed at this stage.

One thing Benbow won't need is pre-programmed software to check spelling. No spelling dictionary currently available in word processing packages knows more words than the *OED*. This preeminence should stand since it won't be difficult to keep the electronic *NOED* both authoritative and up-to-date. The editors will be able to add new words easily and release new editions electronically at regular, timely intervals.

Other On-line Dictionaries

At some point, the dictionary could be put on a single computer chip and built into an ordinary word processor so every writer can have the whole language and its long history at his or her fingertips. In fact, in 5 years, according to one computer expert on the project, the IBM PC will have enough processing power to manipulate this entire database.

Although such American dictionary publishers as Houghton Mifflin and Merriam-Webster have already supplied word

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OED

lists for spelling-checker software, full-scale dictionaries are not yet available in electronic form to microcomputer users. In the next year, however, Houghton Mifflin plans to make the collegiate version of its *American Heritage Dictionary* available on floppy disk. Merriam-Web-

ster hopes to distribute its collegiate dictionary on the Knight-Ridder videotext service as soon as problems in displaying dictionary symbols are overcome.

The OED is in a class by itself, offering information not available from other sources.

As of yet, database hosts have declined to put general English-language dictionaries on line, says Kenneth Duzy, co-editor of the *Directory of Online Databases*, because consumers are reluctant to pay steep on-line fees for accessing information they can get more easily in a hardcover desk dictionary for under \$20. In fact, even as they make plans to enter the market, the dictionary publishers themselves are openly skeptical of the demand for an electronic product. "Is a dictionary accessible by machine going to give you anything better than a book?" asks Jim Withgott, vice-president of Merriam-Webster. "Most CRTs can't adequately display the special character fonts in any case."

The *NOED*, however, may be immune to these market limitations. The *OED* is in a class by itself, offering information not available from other sources. And since it costs \$1,225 in hard copy (and occupies a bookshelf by itself), on-line access by subscription might be more economical for some.

Still, the publishers of the *New Oxford English Dictionary* must design a usable

database. Oxford University Press has recruited researchers at the computer-oriented University of Waterloo in Ontario, Canada, to survey potential users and find

out how they would like to tap the resources of the *NOED*. This information will be used to help design the computer menus and search strategies.

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Edited by Sol Libes

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OED

computer. Add: 2. A calculating-machine; esp. an automatic electronic device for performing mathematical or logical operations; freq. with defining word prefixed, as *analogue, digital, electronic computer* (see these words).

1897 *Engineering* 22 Jan. 104/2 This was a computer made by Mr. W. Cox. He described it as of the nature of a circular slide rule. 1915 *Chambers's Jnl.* July 478/1 By means of this computer the task is performed mechanically and almost instantaneously. 1941 *Nature* 14 June 753/2 The telescope drive is of an elaborate nature; the effects of changing refraction, of differential flexure and of errors in the gears are automatically allowed for by a system of 'computers'. 1944 *Times* 8 July 2/2 The Mark XIV consists of a rectangular box called the computer, which might be described as the brains of the machine. 1946 *Jnl. Appl. Physics* XVII. 262 (heading) A computer for solving linear simultaneous equations. 1946 [see *ELECTRONIC a. 3]. 1947 [see *DIGITAL a. 4]. 1957 *Technology* Mar. 9/1 The advent of the electronic digital computer, with its ability to make simple logical decisions, now permits a further step forward by supplementing the brain power required to supervise the control of manufacturing processes. 1957 *Ibid.* July 167/3 At present a computer can read, remember, do arithmetic, make elementary decisions and print its answers. 1958 *Listener* 18 Sept. 413/2 Much work was done trying to 'programme' a computer to play chess. 1963 *Publishers' Weekly* 5 Aug. 80/1 Computers are being used to speed up the production of justified tape for the operation of typesetting machines. 1964 F. L. WESTWATER *Electronic Computers* i. 1 The popular idea of a computer as an electronic 'brain' is not entirely accurate. a computer 'electronic' 'calculating'

This excerpt from the OED entry for computer demonstrates the dictionary's etymological sophistication and the complexities of putting this mammoth work on-line.

Frank Tompa, University of Waterloo computer science professor, has begun work on a preliminary design of the data structure and software for the electronic NOED. "We're trying to identify the entities and relationships that make up the data in the dictionaries," Tompa says. "Some relationships that are not explicit in print can be made explicit in the database. We might be interested in linking words that have identical pronunciations, words that have similar etymologies, or words that were introduced to the language at the same time."

The database will probably also offer easily accessible subdictionaries specializing in the terms used by such professions as medicine, law, sports, and music. Or, perhaps, computer science.

Microcomputer technology has come far since 1970, the year of the OED's last historical entry for the word *computer*, which refers only to computer typesetting developments but alludes to the technical changes that were yet to come: "One of the unerving things" about computers, the quotation states, "is the pace at which developments take place."



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I have heard the business of real estate investment described as a cross between war and sport, where those who go for wool often return shorn. Indeed, the common demonimator that interests us in business, war, and sport is the competition between at least two players. And that is the only real shortcoming of *Baron*: it is for one player.

I did not complain about the single-player nature of *Tycoon*, Blue Chip's last game (see *PC*, Volume 3 Number 18) because in the commodities market, it is you against the numbers. But real estate investment—fraught with cutthroat competition—is different, and the lack of human or even computer opponents in *Baron* will cost it some appeal. *Baron* is a financial race against time or your previous performance, whichever you prefer. It is not complicated with human ne-

gotiations and alliances, as is *Computer Diplomacy*, and I feel it should be.

Getting Richer

That criticism aside, *Baron* is wonderful. The game is played in 60 turns, each representing 1 month from January 1984 through December 1988. During that time you will invest your initial \$35,000 in your choice of three types of income-producing property, second-mortgage loans, and speculative ventures like Uncle Herman's "real estate

project." The object is to reach a net worth of \$1,000,000 before the game ends. In all probability, you'll borrow as much as you can from the banks, because, as in real life, leverage is the name of this game. If you put down \$5,000 cash on a \$100,000 cooperative apartment and have a bank finance the remaining \$95,000, then your money is leveraged 20 to 1. This is how the poor get richer.

The entire program is menu driven, allowing you to play even if you don't

PC ARCADE

Baron

Blue Chip Software, Inc.
6744 Eton Ave.
Canoga Park, CA 91303
(818) 346-0730

List Price: \$59.95

Requires: 128K RAM, one disk drive; color graphics adapter and color monitor optional.

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ENTER REFERENCE NUMBER OR X FOR MENU.

With a realistic portfolio of investments in a changing market, *Baron* seems like more than just a game.

know what you're doing. The main menu displays your net worth, cash, and status at the top of the screen, below which are listed 11 options. These allow you to call up financial graphs, news, price changes, property descriptions, and your portfolio of investments; to buy and sell real estate, exercise options, and borrow money; to save a game position; and finally, to advance to the next month.

I think you'll enjoy the variety of these information sources because it makes you feel in charge of a research staff. You can find out how the real estate markets are doing in California, New York, Kansas, Florida, and Texas, the five states in which you are allowed to do business. On each turn you can buy up to nine properties from the real estate listing, and the computer changes some from month to month, just to keep things interesting. For example, you might have your eye on a Miami penthouse one month and find it gone the next, particularly if the Florida market goes crazy.

You can get a full-screen listing of each available property, describing everything from square footage and views to price, monthly income it produces, cost of mortgage payments, and operating expenses. Whether it is an industrial building, apartment complex, supermarket, acreage, or a parking lot, you want it to produce more income than it costs you to maintain. And that is where things get tricky, because the complex model mirrors many economic conditions. You can know everything in the world about real estate, but if you don't read the papers, if you don't pay attention to current and historical market trends, if you don't leverage your money well enough, then you will fail the task of turning \$35,000 into \$1,000,000 during the simulated 5-year period.

On PC's scale of zero to six, *Baron* rates:

FUN:	4.5
CHALLENGE:	5.0
SOUND/GRAPHICS:	3.5
TOTAL:	13.0



Computer Diplomacy

Avalon Hill Microcomputer Games
4517 Harford Road
Baltimore, MD 21214
(301) 254-9200
List Price: \$49.95

Requires: 256K RAM, one disk drive, color graphics adapter, color monitor; printer optional.

CIRCLE 791 ON READER SERVICE CARD

"Diplomacy is the art of saying 'nice doggie' until you can find a big rock." I wish I could remember the author of that quotation because it describes the milieu of this epic power struggle to perfection. Many of you remember—indeed, still play—the classic Avalon Hill board game, *Diplomacy*. The rules, map, and number of players (up to seven: the more the better) for this program are identical to those of the original board game, so it can also be used as a "computer referee" along with the physical map and pieces from a *Diplomacy* set.

The time is 1901, Europe is the stage, and seven major powers—Austria-Hungary, France, Germany, Russia, Italy, England, and Turkey—are vying for pieces of the continental pie. The map is displayed on-screen in portions and can be scrolled in four directions with the cursor keys. Although 34 supply centers are strewn about Europe, only 12 are unoccupied at the start of the game. A country wins by occupying 18 supply centers.

The rules for *Computer Diplomacy* are deceptively simple. There are only two kinds of pieces—armies and fleets—and no two can ever be in the same province or sea space. Each unit can move one space per turn. Russia begins with four units (pieces) and four supply centers, and all other countries begin with three of each. To build and introduce a new unit onto the board, you must gain another supply center. And if you lose a supply center during a turn, you lose a unit at the end. Thus, a balance is struck that turns

the road to success into a roller coaster of ups and downs.

There are three phases to each turn (which represents a spring or a fall campaign): diplomacy, order writing, and resolution. And it is the design of the first phase (or lack of it!) that makes this game unique. You see, no single country is strong enough to reach the objective

Everything short
of physical
intimidation is
allowed. Computer
Diplomacy is a
liar's heaven.

alone. Hence, the diplomacy phase is unstructured except for a time limit. Players are free to form alliances, hold secret discussions in other rooms, spy on players having "secret" discussions in other rooms, sign nonaggression pacts, negotiate double deals, triple deals, and betrayals—everything short of physical intimidation is allowed. It is a liar's heaven and an honest person's hell.

In the original game, players write down their moves, reveal them simultaneously, and resolve the differences. But in the computer version, order writing is done from the keyboard by one player at a time. The cryptic abbreviations you must use will seem unfamiliar at first—like TRI A-BUD, which means move the Trieste Army to Budapest—but there is a larger problem with this phase of the game. Other players are not allowed to watch the monitor while you type orders for your armies and fleet. The result of following this rule can range from unpleasant to impractical, depending on the size of your den. In my office at home, all six other players have to crowd into the bathroom to leave the room and we keep the cat's litter in there!

One of the greatest benefits of the pro-

PC ARCADE

gram is its dutiful housekeeping. The computer will not allow players to type in illegal orders. Also, the resolution of all confrontations is controlled by the computer, freeing players from memorizing and applying movement and combat rules. This feature not only makes *Computer Diplomacy* easier and more fun to play than the original but makes the game move faster. Still, it is not a lunch-hour game. With the full complement of seven players (the only way to truly experience *Diplomacy*), you can expect a game to run 6 hours.

On PC's scale of zero to six, *Computer Diplomacy* rates:

FUN:	5.5
CHALLENGE:	6.0
SOUND/GRAPHICS:	4.5
TOTAL:	16.0



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REDirecting Your Files

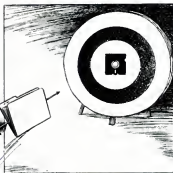
Here's the way to move files from one directory to another without all the usual COPYing and ERASEing bother.

Operating systems designers do their best to provide file management facilities that make maintaining your data and program files as easy as possible. They usually succeed in at least the limited sense that all the things you have to do are possible. They often fail, however, in that accomplishing all those possible things aren't necessarily easy or convenient.

PC-DOS is no exception to this rule. When Version 2.0 was released, in March of 1983, powerful subdirectory facilities were added. These gave PC-XT and other hard disk users a simple way to organize files, and they enhanced file storage facilities for floppy disks as well. PC-DOS Versions 2.1 and 3.0 continued the subdirectory system but added no new capabilities to it.

The subdirectory system works well enough, but a few additional features would make your life much easier. One such missing feature is a command to move a file from one subdirectory to another without physically rewriting it. Standard PC-DOS commands require you to COPY the file from the directory it's in (the source directory) to the one in which you want to put it (the target directory). You then have to ERASE the original file from the source directory. This procedure is inconvenient and time-consuming even on a hard disk, and it is impossible on a

1985/No. 4



floppy disk if you're short on space.

Upgrading Cleanup

When I changed from a PC-XT to a new AT, my files and programs got reorganized during the "housecleaning" that inevitably accompanies such a move. During that process, the COPY/ERASE procedure became simply too painful to bear anymore, so I wrote a command called REDIRECT, or RED for short. REDirect does just what I described above: it changes the directory a file is in (redirects it) without physically moving it.

A major design criterion for REDirect was that its rules and syntax should look as much like those of the PC-DOS COPY



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PROGRAMMING

command as possible. The REDirect syntax is

```
RED [d:][ (source) path]
      filename[.ext]
      [d:][ (target) path]
```

The source filename may include PC-DOS wildcard characters (?) and (*). And, as with COPY, you enter a space between naming the source and specifying its destination.

REDirect's syntax does make two exceptions to COPY's rules, however. The first is that REDirect's source and target disk drives must be the same (COPY's can be different). The other is that REDirect

REDirect makes extensive use of the PC-DOS function calls available through interrupt 21H.

REDirect does not allow simultaneously renaming the file, as COPY does. When REDirect changes a file's directory, its original name is retained. You can, of course, RENAME it later if you want—or change REDirect to allow renaming files, if you're energetic.

Calling on Function Calls

REDirect is an assembly language program that makes extensive use of the PC-DOS function calls available through interrupt 21H. If you decide to implement it, you will probably want to have the PC-DOS *Technical Reference* manual available for information about how each function call works.

The first half of the program (through the label FIND_FILE: in Figure 1) is devoted to parsing the command line into the source file and target path and to making sure the resulting ASCII string formats meet REDirect's requirements. (The Z stands for a byte of zeros at the end of the

string, as the *DOS Technical Reference* manual notes.) The code is complicated, and you'll wish PC-DOS would take care of this for you before you're done.

PC-DOS commands can be input in either upper- or lowercase letters, and five different characters (blank, comma, semicolon, equals sign, and tab) can be used as delimiters to separate parameters. REDirect's first pass (starting at CLEAN_PARMS:) through the parameter string (which PC-DOS puts at location 80H of the program segment prefix, or PSP) converts lower- to uppercase letters and changes all valid delimiters into blanks. This makes the parameter string consistent and easier to work with.

The next job (starting just above FIND_PARMS:) is to separate the parameters into two separate pieces (remember, any number of delimiters can separate parameters) and to store them in memory areas called SOURCE_FILE and TARGET_PATH. The first byte of each memory area is set to the number of data bytes stored in it. The algorithm employed by REDirect loads the maximum number of expected parameters into the DX register, and it puts a pointer to the first memory area in the BX register. The algorithm requires that the memory areas be stored contiguously and be exactly the same length.

Once SOURCE_FILE and TARGET_PATH are stored in program memory, REDirect has to make sure their syntax is correct and that the location where the filename can begin in each parameter's memory area is known. The location is the first byte after the backslash character (\) used by PC-DOS path names.

The code starting at FIX_UP: locates the last backslash in SOURCE_FILE (it searches backwards from the last byte), and then stores this location in SOURCE_END. If no backslash is found, no source directory was specified, so SOURCE_END is set to the second byte (byte 1) of SOURCE_FILE. An exception is made if a disk drive was specified, in which case SOURCE_END is set to the

PROGRAMMING

fourth byte (byte 3). This allows the source file's path specification to default to the current directory and drive, or to the current directory for a named drive.

After SOURCE_FILE has been fixed, REDirect checks TARGET_PATH for validity. If no TARGET_PATH was specified, the program jumps to NO_TARGET, which allows subsequent function calls to default to the current drive and directory. If a TARGET_PATH was specified, its last character is checked to see if it was a backslash. If so, TARGET_END is set to the next byte; if not, a backslash is inserted. An exception is made if only a disk drive was specified. In that case, TARGET_END is set to the first byte after the colon, allowing the target path to default to the current directory of the specified drive.

And Now for the Fun Part

So much for REDirect's more gruesome chores! The rest of the program (starting at FIND_FILE:) is fun, since PC-DOS function calls do all the hard work. The first function needed is 4EH, which finds the first file in a directory that matches a file specification. Function 4EH is paired up with 4FH (see below) to allow REDirect access to PC-DOS's wild card filename facility.

Everything done above ensures that SOURCE_FILE is correctly formatted as an ASCII string (including a file specification, an optional disk drive, and a path name specification) that can be used by function 4EH. All REDirect now needs to do is to move the address (offset) of SOURCE_FILE (plus one, to account for the byte count field) to DX. The CX reg-

ister is set to zero to tell function 4EH to search only for normal files.

When interrupt 21H returns, the carry flag is used to indicate an error condition. When function 4EH is used, the carry flag simply indicates that no file matching SOURCE_FILE's specifications was found (other function calls can require more complex interpretation of errors). In that case, REDirect exits with an error message by jumping to ERROR_EXIT with DX pointing to the "File not found" error message.

If a file was found, REDirect copies its name from the filename portion of the default Disk Transfer Area (PC-DOS locates this at offset 9EH in the PSP) to SOURCE_FILE and to TARGET_PATH. The locations for the filename in those areas are specified by using both the

```

RED segment para public 'code'
    assume cs:RED, ds:RED, es:RED, ss:NOTHING
    org 100h ; .COM format
BEGIN:
    jmp CODE_START ; Jump around data declarations
;
DECLARE:
; Messages, Storage Areas, Equates
COPYRIGHT db 'REDirect (C) 1985, Dickinson Associates Inc.'
           db 13,10,'$'
PATH_FILE_LEN equ 77 ;Length = 1, Path = 63, FileName = 12, 0 = 1
SOURCE_FILE db PATH_FILE_LEN dup (0)
TARGET_PATH db PATH_FILE_LEN dup (0)
SOURCE_END dw 0
TARGET_END dw 0
PC_DOS_VER db 0
VALID_IN db 'abcdefghijklmnopqrstuvwxyz,=';9
VALID_OUT db 'ABCDEFGHJKLMNPQRSTUVWXYZ',4 dup(32)
VALID_NUM equ $ - VALID_OUT + 1
ERR_FLAG db 0
ERR_HEAD db 10,13,'REDirect Error - $'
BAD_VERSION db 'Incorrect PC-DOS Versions$'
NO_PARAMS db 'Correct Syntax is: ',13,10,10
db 'RED [d:][source_path]source_filename[.ext] [d:][target_path]$'
FILE_NOT_FOUND db 'File Not Found$'
PATH_NOT_FOUND db 'Target Path Not Found$'
PC_DOS_2_PATCH db 13,10,'or $'
DRIVES_CONFLICT db 'Source and Target Disk Drives Conflict$'
UNDEFINED_ERR db 'Undefined Error: PC-DOS Function 56H$'
ERR_TAIL db 10,10,13,'... Aborting',10,13,13,'$'
GOOD_MSG db '... REDirected to ... $'
    
```

(continues)

Figure 1: The assembly language program for RED.COM. If you don't have IBM's assembler, turn on your modem and call the PC Bulletin Board at the number listed in the masthead.

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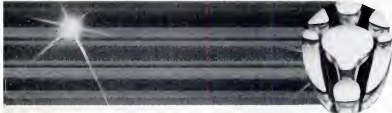
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```

BAD_MSG1      db      ' . . NOT REDirected . . $'
BAD_MSG2      db      ' . . already exists$'
END_LINE      db      10,13,'$'

;
CODE_START:   ; Parse command line into source & target parameters
              mov     dx,offset COPYRIGHT      ; Display copyright notice
              mov     ah,9h
              int     21h
              mov     ah,30h                  ; Get PC-DOS Version
              int     21h
              mov     pc_dos_ver,al
              mov     si,80h                  ; PSP parameter byte count pointer
              mov     cl,[si]                  ; Move byte count to CL
              xor     ch,ch                    ; Zero CH
              jcxz    NO_PARAMS_PASSED        ; If CX is zero, there are no parameters
              mov     dx,cx                    ; Save byte count in dx
              inc     si                       ; Point to parameter area
              mov     di,si                    ; Copy SI to DI for cleanup routine
              cld                               ; Set direction flag to forward
CLEAN_PARAMS:  ; Change valid delimiters to blanks, lower to upper case
              lodsb                               ; Load each character to AL
              push    di                       ; Save DI on stack
              mov     di,offset VALID_IN       ; Point to table of valid inputs
              push    cx                       ; Save CX on stack
              mov     cx,VALID_NUM             ; Set CX to number of inputs to look for
repne         scasb                               ; See if any are in AL
              jcxz    CLEAN_END                 ; If not, change nothing
              mov     bx,VALID_NUM             ; Set up BX to point to valid output
              sub     bx,cx                     ; This will leave BX one off
              mov     al,VALID_OUT [bx - 1]     ; Load the valid output to AL
CLEAN_END:
              pop     cx                       ; Restore CX
              pop     di                       ; Restore DI
              stosb                               ; Store modified AL back to PSP
loop         CLEAN_PARAMS                       ; Loop until CX is zero
;
              mov     cx,dx                    ; Restore number of bytes in PSP to CX
              mov     dx,2                     ; Set DX to look for up to 2 parameters
              mov     bx,offset SOURCE_FILE     ; Set BX to address of 1st parameter
              mov     al,' '                   ; Set up to scan for first non-blank
              mov     di,81h                   ; Set DI to PC-DOS parameter pointer
FIND_PARAMS:  ; Start looking for parameters, load to program storage
repe         scasb                               ; Scan while blanks
              mov     si,di                     ; Set SI to second non-blank byte
              dec     si                       ; Adjust it to first non-blank byte
              inc     cx                       ; Adjust CX to compensate
              jcxz    PARAMS_LOADED            ; If CX is zero, no parameters left
              mov     di,bx                     ; Set DI to parameter hold area
              mov     ax,cx                     ; Store CX to first byte of hold area
              stosb                               ; DI is adjusted to second byte here
STORE:        lodsb                               ; Load each byte to AL
              cmp     al,' '                   ; Is it a blank?
              jz      END_STORE                 ; Yes, end of this parameter
              stosb                               ; No, store the byte to hold area
END_STORE:
              loopnz  STORE                     ; Keep looking
              sub     [bx],cx                   ; Store number of bytes in each

```

(Figure 1 continues)

PROGRAMMING

```

jcxz    PARMS_LOADED      ; If CX is zero, no more parameters
dec     byte_ptr [bx]     ; parameter to first byte of hold area
mov     di,si             ; Set up to scan for next non-blank
dec     di                ; Adjust DI to point to the blank
inc     cx                ; Adjust CX to compensate
dec     dx                ; Decrement DX counter
cmp     dx,0              ; Is DX zero?
jz      PARMS_LOADED      ; Yes, all expected parameters loaded
add     bx,PATH_FILE_LEN  ; No, point to next part of hold area
jmp     FIND_PARMS        ; Go back and look for more
PARMS_LOADED:             ; All parameters are loaded
cmp     SOURCE_FILE[0],0  ; If there are no bytes in the
ja      FIX_UP            ; SOURCE_FILE, no parameters present
NO_PARMS_PASSED:         ; Exit with an error if there
mov     dx,offset NO_PARMS ; are no parameters passed
jmp     ERROR_EXIT

FIX_UP:                   ; Fix SOURCE_FILE and TARGET_PATH
RED_MSG proc near        ; Display message for each file
mov     cx,2              ; 2 fields - source & target file
mov     bx,offset SOURCE_FILE + 1 ; Point to source file
START1: mov     si,bx     ; Copy BX to SI
START2: lodsb           ; Load each byte to AL
cmp     al,0             ; If ASCII 0, end of field
je      BETWEEN
mov     di,al             ; Copy byte to DI for function 2H
mov     ah,2h             ; Request function 2H
int     21h              ; Call PC-DOS
jmp     START2            ; Get next character
BETWEEN: cmp     cx,2     ; Is it first or second field?
jne     CR_LF             ; If second, display end of message
cmp     ERR_FLAG,0        ; Is this a success message?
jz      OK1               ; Yes, go use GOOD_MSG
mov     dx,offset BAD_MSG1 ; No, display first part of BAD_MSG
mov     ah,9h             ; Request function 9H
int     21h              ; Call PC-DOS
jmp     NEXT              ; Go process next field
OK1:    mov     dx,offset GOOD_MSG ; Display GOOD_MSG
mov     ah,9h             ; Request function 9H
int     21h              ; Call PC-DOS
jmp     NEXT              ; Go process next field
CR_LF:  cmp     ERR_FLAG,0 ; Is this a success message?
jz      OK2               ; Yes, go terminate message
mov     dx,offset BAD_MSG2 ; No, display second part of BAD_MSG
mov     ah,9h             ; Request function 9H
int     21h              ; Call PC-DOS
PC_DOS_2: cmp     PC_DOS_VER,3 ; Patch for incorrect error
jae     OK2               ; return in PC-DOS 2.0 and 2.1
mov     dx,offset PC_DOS_2_PATCH
mov     ah,9h             ; Request function 9H
int     21h              ; Call PC-DOS
mov     dx,offset PATH_NOT_FOUND
int     21h              ; Call PC-DOS
OK2:    mov     dx,offset END_LINE ; Terminate display line
mov     ah,9h             ; Request function 9H
int     21h              ; Call PC-DOS
NEXT:   add     bx,PATH_FILE_LEN ; Move BX to point to next field

```

(Figure 1 continues)

PROGRAMMING

```

loop      START1                ; Loop for second field
ret
RED_MSG   endp                ; Or end and return to callint point
RED       ends
end       BEGIN
mov       di,SOURCE_END        ; DI points to end of source path
mov       si,9eh               ; SI points to default DTA in PSP
mov       cx,13                ; DTA will have 13 bytes
rep       movsb                ; Move bytes to SOURCE_FILE
mov       di,TARGET_END        ; DI points to end of target path
mov       si,9eh               ; SI points to default DTA in PSP
mov       cx,13                ; DTA will have 13 bytes
rep       movsb                ; Move bytes to TARGET_PATH
;
mov       dx,offset SOURCE_FILE + 1 ; DX points to old file name
mov       di,offset TARGET_PATH + 1 ; DI points to new file name
mov       ah,56h               ; Request function 56H (rename file)
int       21h                 ; Call PC-DOS
jnc       GOOD_RED             ; If no error, call was successful
cmp       ax,3                 ; Check for error 3 (path not found)
jne       ERR_5
mov       dx,offset PATH_NOT_FOUND
jmp       ERROR_EXIT           ; Exit program with error message
ERR_5:    cmp       ax,5        ; Check for error 5 (file inaccessible)
jne       ERR_17
mov       ERR_FLAG,1          ; Soft error -
call      RED_MSG             ; Issue message with subroutine
jmp       NEXT_FILE           ; and keep going
ERR_17:   cmp       ax,17      ; Check for error 17 (drive conflict)
jne       UNDEF
mov       dx,offset DRIVES_CONFLICT
jmp       ERROR_EXIT           ; Exit program with error message
UNDEF:    mov       dx,offset UNDEFINED_ERR ; Undefined error from function 56H
jmp       ERROR_EXIT           ; Exit program with error message
GOOD_RED: mov       ERR_FLAG,0 ; Set error flag off and
call      RED_MSG             ; issue message with subroutine
NEXT_FILE: mov       ah,4fh    ; Look for next file
mov       cx,0                ; Request function 4FH (find next file)
mov       cx,0
int       21h
jnc       FOUND_ANOTHER       ; No error, another file was found
jmp       END_OK               ; Error, we're done finding files
FOUND_ANOTHER: jmp       FOUND_FILE ; Go process next file
END_OK:   int       20h        ; Exit to PC-DOS
ERROR_EXIT: ; Print Error Message and Exit
push      dx                  ; Save error message pointer on stack
mov       ah,9                ; Display error header
mov       dx,offset ERR_HEAD
int       21h
mov       ah,9                ; Display error message
pop       dx
int       21h
mov       ah,9                ; Display error tail
mov       dx,offset ERR_TAIL

```

(Figure 1 continues)

PROGRAMMING

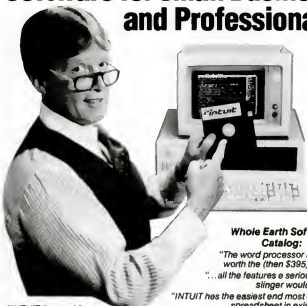
```

int    21h
int    20h                                ; Exit to PC-DOS
mov     si,offset SOURCE_FILE             ; For Search and Rename calls
lodsb                                     ; Get Number of bytes
xor     ah,ah                             ; Zero high byte of AX
mov     di,si                             ; Move SI to DI for scan
add     di,ax                             ; Start scan at end of parameter
dec     di
mov     cx,ax                             ; Set CX to number of bytes
mov     al,'\'                             ; Scan for the last '\'
std
scasb                                     ; Set direction flag to reverse
repnz                                     ; Scan while not '\'
jnz     NO_SOURCE_DIR                     ; If Zero Flag not set, '\' not found
add     di,2                             ; Add 2 to DI to point to file name
jmp     SOURCE_FIXED                     ; position
NO_SOURCE_DIR:
add     di,1                             ; No source directory was specified
cmp     SOURCE_FILE[2],':'               ; Adjust DI
jne     SOURCE_FIXED                     ; Check for specified disk drive
mov     di,offset SOURCE_FILE[3]         ; None present, we're done
SOURCE_FIXED:
mov     SOURCE_END,di                     ; Yes, set DI to point to first byte
;                                         ; after ':'
;                                         ; Move DI to SOURCE_END pointer
;
cld                                       ; Set direction flag to forward
mov     si,offset TARGET_PATH             ; Set up to look for '\' present
lodsb                                     ; Get number of bytes
cmp     al,0                             ; If it's zero, no target specified
je      NO_TARGET
xor     ah,ah                             ; Zero high byte of AX
add     si,ax                             ; Add it to SI to point to end
dec     si                               ; Decrement SI to adjust
lodsb                                     ; Look at last byte
mov     di,si                             ; Copy SI to DI
cmp     al,'\'                             ; Is last byte a '\'?
je      TARGET_FIXED                     ; Yes, everything's fine
cmp     TARGET_PATH[0],2                 ; If TARGET_PATH is 2 bytes long and
jne     STORE_SLASH                     ; is a disk drive specification,
cmp     TARGET_PATH[2],':'               ; let it default to the current
je      TARGET_FIXED                     ; directory.
STORE_SLASH:
mov     al,'\'                             ; Place a '\' at the end of
stosb                                     ; TARGET_PATH if user did
;                                         ; not
TARGET_FIXED:
mov     TARGET_END,di                     ; Move DI to TARGET_END pointer
jmp     FIND_FILE
NO_TARGET:
mov     TARGET_END,offset TARGET_PATH + 1 ; Set up to allow target path default
;                                         ; to current path
FIND_FILE:
mov     dx,offset SOURCE_FILE + 1         ; DX points to SOURCE_FILE
mov     ah,4eh                           ; Request function 4EH (find 1st file)
mov     cx,0                             ; Set CX to zero for normal files only
int     21h                             ; Call PC-DOS
jnc     FOUND_FILE                       ; If no error, first file found
mov     dx,offset FILE_NOT_FOUND         ; If no files found, exit
jmp     ERROR_EXIT                       ; program with error message
FOUND_FILE:

```

(Figure 1 ends)

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PROGRAMMING

SOURCE_END and TARGET_END pointers calculated in the previous section of REDirect. Unless an error occurs, the program will return here for every file found.

The next PC-DOS function call used is 56H, which is the key to accomplishing REDirect's purpose. Function 56H can

To make REDirect work, you have to assemble it using IBM's PC Assembler and then link it.

rename a file at any level of its path and/or filename. REDirect uses it to rename only the path associated with the file, not the filename itself. As a result, all function 56H must do is to copy the file's directory entry from the source directory to the target directory and then delete it from the source directory.

Function 56H is executed by moving a pointer for the current filename (which is stored in an ASCII string) to the DX register, moving a pointer for the new name (again in an ASCII string) into the DI register, and then calling interrupt 21H. If, on returning from interrupt 21H, the carry flag is not set the rename was successful, and REDirect jumps to GOOD_RED, where the subroutine RED_MSG is called to tell you the good news.

If the carry flag comes back set, the rename failed. There are three documented reasons for such a failure. If the return code (which is found in the AX register) is 3, the target path specified was not found. In PC-DOS 3.0 this usually means that the target directory does not exist, so REDirect terminates the program by jumping to ERROR_EXIT with DX pointing to the "Path not found" error message.

However, PC-DOS 2.0 and 2.1 do not seem to return this error code when the target directory does not exist. Instead,

PROGRAMMING

those versions of PC-DOS return error code 5, which indicates that the target file was "inaccessible". In PC-DOS 3.0, this error actually means that the file already exists in the target directory, and REDirect calls RED_MSG to tell you that the indicated file was not redirected. There is a patch (admittedly ad hoc) in the RED_MSG subroutine that modifies this message if PC-DOS 2.0 or 2.1 is running and error code 5 turns up.

The last documented source of error occurs if the source and target disk drives are not the same (error code 17). REDirect treats this as a fatal error and terminates the program. If an unexpected return code comes back from using function 56H, REDirect exits with an appropriate message.

After each file has been REDirected, REDirect uses function 4FH to see if another file also matches the source file specification. Function 4EH leaves enough data in the DTA to require no information when function 4FH is called. If the carry flag is set, no further files were found, so REDirect terminates. If not, REDirect jumps back to FOUND_FILE to process the next file.

Up and Running

That's all there is to it. To make REDirect work, you have to assemble it using IBM's PC Assembler (ASM, MASM, or Release 2 will do fine) then link it using the PC-DOS linker. REDirect is designed as a .COM file, so it has to be converted from .EXE format to .COM format using EXE2BIN. Unfortunately, REDirect is too long to be created using the DEBUG assembler or even a BASIC program. [Editor's Note: If you haven't got the IBM Assembler, be patient. PC's published programs will soon be available on a bulletin board for downloading.]

When you've got a version of REDirect running, test it on scratch floppy disks. It's only too easy to insert an error in such a long program, and there's no point risking the integrity of your hard disk while testing your new command. ■

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Screen FLIPper

Are you ever forced to copy information from your screen before it scrolls off into the ozone? There's a simple solution: if you have a color/graphics card you can use one of its "underexploited" video pages as a scratch pad. The short assembly language listing in Figure 1 creates a program called FLIP.COM that allows you to flip between two video pages while working from DOS 2.x. I find this especially useful while compiling programs. By getting a directory of my work disk on one page and then flipping to the other page to compile and link, I always have a list of my files handy for reference.

FLIP.COM switches the active page back and forth between 0 and 1 by making calls to the BIOS. By controlling the cur-

sor location, it also ensures that the screens are not scrolled as you flip back and forth between them. The cursor changes to a block shape in page 1 so you always know which page you are using; you need to know which page is active since the PC's alternate video pages are completely ignored by most screen-oriented programs, such as *WordStar*. Many of these programs write to the standard page (0) without bothering to check which page is actually being displayed. Be sure that the normal (2-line) cursor is displayed before calling such a program.

While I named the program FLIP.COM, you might want to rename it to something shorter. Since it takes up only 62 bytes, it's convenient to put it in a RAMdisk with AUTOEXEC.BAT and just leave it there.

K. Scott Hunziker
Cambridge, Mass.

It is a pity that most programs ignore the PC's paging feature, since there is always 16K available on the color/graphics display card, and since an 80-column text screen takes up only 4K. Applications could load in help screens, for instance, and switch back and forth between them and the main screen in an instant. Or programs could park themselves, flip to an alternate page, and do various DOS chores without disturbing the image on the

USER-TO-USER

```

code_seg      segment
assume cs:code_seg
org 100h
begin:
mov ah,15      ; read video state (call to BIOS)
int 10h
and bh,1        ; make sure we deal only with 0 or 1
xor bh,1        ; switch to other page
mov bl,bh      ; save new page number
mov al,bh      ; set new active page (call to BIOS)
mov ah,5
int 10h
mov dh,22      ; set cursor to row 22
mov dl,0       ; and column 0
mov ah,2       ; set cursor position (call to BIOS)
int 10h
mov oh,6       ; assume page 0, begin cursor at 6
mov cl,7       ; and cursor at line 7
or bh,bh       ; check new page number
jz is_zero     ; if new page is 0, we guessed right
mov oh,0       ; cursor begins at line 0
is_zero:
mov ah,1       ; set cursor type (call to BIOS)
int 10h
mov oh,23      ; set upper left of window to row 23
mov cl,0       ; and column 0
mov dh,24      ; set lower right of window to row 24
mov dl,79      ; and column 79
mov al,0       ; blank the window
mov bh,7       ; use white on black
mov ah,6       ; perform window scroll (call to BIOS)
int 10h
mov al,bl      ; supply new page number as return code
mov ah,4ch     ; exit to DOS
int 21h
anda
code_seg      and begin

```

Figure 1: Assembly listing for FLIP.COM screen-page flipper.

```

100 'FLIP.BAS -- K. S. Nunziker -- creates FLIP.COM
110 FOR I=1 TO 62:READ J0:N=VAL("&N*J0"):S=S+N:NEXT
120 IF S=6622 THEN 140
130 PRINT "Check your DATA statements and restart.":END
140 RESTORE
150 OPEN "FLIP.COM" FOR OUTPUT AS #1
160 FOR I=1 TO 62:
170 READ J0:N=VAL("&N*J0"):PRINT #1,CNR0(N);
180 NEXT
190 CLOSE:PRINT "FLIP.COM created"
200 END
210 DATA 04,0F,CD,10,00,E7,01,00,F7,01,0A,DF,0A,C7,04,05
220 DATA CD,10,06,16,02,00,04,02,CD,10,05,06,01,07,0A,FF
230 DATA 74,02,05,00,04,01,CD,10,05,17,01,00,06,10,02,4F
240 DATA 00,00,07,07,04,06,CD,10,0A,03,04,4C,CD,21

```

Figure 2: BASIC FLIP.BAS program that creates the FLIP.COM screen-page flipper. First run this program to create the file. Then, each time you type FLIP the screen will switch from active page 0 to active page 1 or vice versa.

main screen, giving you a full-screen DOS window at all times.

Fortunately, BASIC allows screen paging (on the color/graphics card in text mode) with the statement

```
SCREEN . . , A , V
```

where A is the active page (the one the

program writes to) and V is the visual page (the one the program displays). The active and visual pages can be the same, but it's a neat trick to write to a different page from the one currently being displayed. Then when the user or the program switches visual pages, the new page pops impressively into view in an instant.

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USER-TO-USER

BASIC lets you use up to four different simultaneous pages in 80-width text mode, and up to eight in 40-width text mode.

If you don't have the **BASIC** assembler, you can create **FLIP.COM** by running the **FLIP.BAS** program in Figure 2. **FLIP.COM** is handy, but do be careful not to run programs like **WordStar** while in a nonzero screen.

WordStar Printer Patch

Many **WordStar** users have two printers—a dot matrix printer for speed and an impact printer for letter quality output. In the past it wasn't easy to switch from one printer to the other without manually moving the printer cable back and forth. However, by changing two bytes in **WS.COM**

```
A>debug ws2.com
-e 7d0 1
-e 7e6 1
-w
Writing 5380 bytes
-q
```

Figure 3: Instructions for changing **WordStar** so it sends output to **LPT2**: rather than **LPT1**: Type in everything underlined. Then start **WordStar** by typing **WS2** rather than just **WS**. Before you try this, copy your **WS.COM** file to one named **WS2.COM**. Never patch your original **WS.COM**.

with **DEBUG**, **WordStar** users with two parallel printer ports (**LPT1**: and **LPT2**:) can send output that would ordinarily go to **LPT1**: to **LPT2**: instead. To make the change, type in everything underlined in Figure 3. To change back to **LPT1**:, substitute 0s for 1s in the lines that begin with **e**. It's best to keep two versions of **WordStar**, one that sends output to **LPT1**: and the other to **LPT2**..

Marco Papa
Los Angeles, Calif.

If you do this, first make a copy of **WS.COM** called **WS2.COM**, then make the indicated changes on **WS2.COM**. To print on **LPT1**: use your normal **WS** file; to

send the output to **LPT2**: use **WS2** instead. It's unfortunate that you'll have to keep two 21K files that vary only by two bytes, but space these days is cheap.

DIR for Directories

The root directory of my **PC-XT** contains a great many files in addition to my numerous directories. It would be useful to be able to get a listing of the directories only, so I could browse through the list when I can't remember which directory contains a certain file.

A colleague suggested that I give all directories an extension, such as **.DIR** or **.D**, which would let me list all my directories by typing

DIR *.DIR

or

DIR *.D

However, there is a better way. The command **DIR *** will list all the directory names, as well as any files that have no extension. Since I have few of the latter, it is easy enough to separate the directories by eye.

J. B. Sladen
Memphis, Tenn.

In **DOS 2.1**, you can get a list of all files without extensions by typing in

DIR.

Since most people don't add extensions to their directories, this method will produce a list of all directories (as well as all filenames without extensions). However, in **DOS 3.0**, this won't work; instead you have to type

DIR *

The best way to organize your hard disk, in our opinion, is to put no files on your root directory except for the three that you absolutely need. You have to put **COMMAND.COM** on your hard disk if you want to boot off it rather than a floppy. (Your two other system files, **IBMDOS.COM** and **IBMBIOS.COM**, will also

USER-TO-USER

be in your root directory, but you won't see them because DOS marks these as "hidden" from normal directory searches.)

It's undoubtedly a good idea to add an AUTOEXEC.BAT file to start the ball rolling each time you turn your computer on. And on any hard disk you should also have a CONFIG.SYS file that specifies the number of buffers DOS will allocate. Peter Norton (in *The Norton Chronicles*, PC, Volume 3 Number 25) suggests BUFFERS=16 for a 10-MB PC-XT and BUFFERS=32 for a 20-MB PC AT. CONFIG.SYS can also tell DOS such other important things as how frequently to check for the Ctrl-Break keystroke combination or what device drivers (such as ANSI.SYS) to load.

But aside from these three, you really don't need to put anything else on your root directory—except the names of your main subdirectories, of course. If you organize your hard disk this way, you can get a list of all your subdirectories just by typing DIR. If it really bothers you to see the three files mentioned above, type in DIR *. (and be sure your directories don't themselves have any extensions—they don't need them).

If you do this, you'll probably want to PATH to important overlays and files buried inside various subdirectories. The DOS 2.x and 3.0 PATH command won't look for anything except .COM, .EXE, and .BAT files, although it is rumored that IBM widened the search to include non-executable files in versions later than 3.0. Until then, you can buy one of the many extended-PATH utilities on the market that will do this for you.

Yet Another WordStar Fix

Ever since WordStar's first release for the PC, devoted users have complained about the goofy way it makes the Del key do what the backspace key should do and the backspace duplicate the function of the left arrow key. I supplied the patch for the former in these pages many moons ago, but the latter eluded me. Until now.

You don't have to buy the abysmally disappointing WordStar 2000 or even a keyboard enhancer to correct the problem. Just put a spare copy of WS.COM in drive B: and a copy of DEBUG.COM in drive A: At the A> prompt, type DEBUG B:WS.COM. At the hyphen prompt, enter

E 49B

0D should be displayed. Type in AE and hit the spacebar. 7E should be displayed. Type in 83 and hit the Enter key. Then enter

E 68E

You should see 08 displayed. Type in 13 and hit the Enter key. You've now got a destructive backspace where it should be. To fix the delete key, enter

0 71C

The screen should show 7F. Type in 07 and hit the Enter key. Then type W and hit the Enter key. DEBUG will give you a little message about how many bytes it's writing to disk. After that, all you have to do is enter Q for quit, and your WordStar will work like a charm.

Stephen Manes
Riverdale, N.Y.

Finally, a real backspace key in WordStar. This one does work like a charm. It was always easy to get the backspace to become destructive, but it took the left arrow with it. This patch does it right and should make a lot of WordStar users awfully happy.

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PC Tutor



Using Assembler in BASIC

Q: How can I embed assembly language subroutines into my BASIC programs? Similarly, how can I take advantage of the IBM BIOS calls?

Mark Lewis
Cambridge, Massachusetts

A: This is a pair of questions I get asked fairly frequently. Let me answer in detail by using a simple example in which you clear a rectangular portion of the screen.

First, you need to create the requisite assembly code. This is most easily done with DEBUG's A command, which facilitates in-line assembly.

By way of illustration, I have produced a general-purpose assembly language BIOS calling routine. All of the IBM BIOS calls are accessible by performing an 8088 INT *nn* call. The IBM video BIOS call is INT 16 (decimal), for example. By setting the 8088 registers, you can access all of the BIOS features except for returning results.

Your first step is to find out the proper syntax by reading the IBM *Technical Reference* manual. A glance at the manual provides the following information about the registers:

```

AH = 6 scrolls the active window
AL = number of lines to screen
      (AL=8 clears the entire window)
(CH,CL) = (row,column) start
(DH,DH) = (row,column) end
BH = attribute to use on blank lines

```

Through the use of these registers, a simple assembly language subroutine might be created with the debugger, as follows:

```

A>DEBUG
~>100
XXXX:0100 PUSH BP
XXXX:0101 MOV AL,01
XXXX:0103 MOV AH,01
XXXX:0105 MOV BL,01
XXXX:0107 MOV BH,01
XXXX:0109 MOV CL,01
XXXX:010B MOV CH,01
XXXX:010D MOV DL,01
XXXX:010F MOV DH,01
XXXX:0111 INT 01
XXXX:0113 POP BP
XXXX:0114 RETF

```

The parameters entered here (all I's) are arbitrary. Since this program will have no arguments, a RETF (Return Far) is used at the end. The parameters are arbitrary since the BASIC program will be altering them to suit. The RETF at the end of the program should have a number following it equal to 2 times the number of arguments.

To display the machine code (in hex) for this program, type d in response to DEBUG's hyphen prompt. This will produce 2-byte lines of numbers after the addresses, followed by ASCII equivalents, where possible. This display is shown in Figure 1, without the ASCII columns that will appear on the far right side of your screen. To exit from DEBUG, simply type q after the prompt.

The next step is to create the BASIC program, which is listed in Figure 2. Here, I have set up a character string to make the assignments more obvious. Since BASIC stores the address of the string at (varptr+1), you need to first find the VARPTR and then do some PEEKs to find the actual code string address.

By setting the registers (AL,AH, . . .) and the interrupt number (INTNUMBER) within your main program (lines 140-180), and then calling this as a subroutine, you can access the internals of the PC quite easily. I separated the routine into setup and run sections so that the setup of the BIOS string need to be done only once.

Sequential Syntax

Q: How can I make my BASIC program open a sequential file on drive B: using a name the user enters from the keyboard? On the A: drive this is done with the following statements:

```

10 INPUT "Filename"; N$
20 OPEN N$ FOR OUTPUT AS #1

```

For the B: drive, I've tried the following:

```

10 INPUT "Filename"; N$
20 OPEN "B:"N$ FOR OUTPUT AS #1

```

This, however, opens a file on the B: drive and assigns to it the name "N\$", not the user's entry.

John W. Haines
Phoenix, Arizona

A: Since OPEN expects a character string as the filename, to accomplish what you want you just need to create a name that begins with "B:" and ends with the user's desired filename. The following routine will do that:

```

10 INPUT "Filename";N$
20 OPEN "B:"N$ FOR OUTPUT AS #1

```

Note the use of the plus sign (+) here to produce string concatenation. This lets you make up filenames of any desired complexity, and this is what was missing in your procedure. Under DOS 2.x for example, if you want your files to be put in a specific subdirectory (named DATA-FILE in this example), you might use

```

10 INPUT "Filename"; N$
20 OPEN "B:\DATA\FILE"+N$ FOR OUTPUT AS #1

```

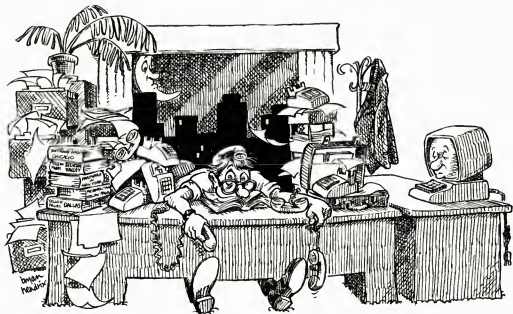
you will find that while the files in the

```
-dl00
0FB9:0100 55 B0 01 B4 01 B3 01 B7-01 B1 01 B5 01 B2 01 B6
0FB9:0110 01 CD 01 5D CB
-q
```

```

000 REM Sample program using BIOS
110 ' by Mark Sachmann
120 GOSUB 1000 : 'Set the BIOS$ string
121
130 ' This routine clears a rectangular area
140 ' defined by (CB,CL) and (DB,DL),
150 AH=6 : AL=0 : BH=7
160 ' In this example, from (5,5) to (20,40)
170 CL = 5 : CH = 5 : DH = 20 : DL = 40
170 ' Use Interrupt 16 - video interrupt
180 INTNUMBER = 16
190 GOSUB 2000 : 'call the BIOS subroutine
200 END
998
999
1000 REM General Interrupt Calling Routine Setup
1010 DEF SEG
1020 DATA sh55, shB0, 1, shb4, 1, shB3, 1, shB7
1025 DATA 1, shb1, 1, shB5, 1, shB2, 1, shb6
1030 DATA 1, shCD, 1, sh50, shCB
1030 ' Make a string large enough for the
1039 ' routine (29 periods, below)
1040 BIOS$=".....*,"
1049 ' Initialize the string
1050 RESTORE 1020
1060 FOR I=1 TO 21
1063 READ J : MID$(BIOS$,I,1)=CHR$(J)
1065 NEXT I
1070 RETURN
1998
1999
2000 DEF SEG : 'REM Set up the string
2005 ' variables (registers)
2010 MID$(BIOS$,3,1) = CHR$(AL)
2020 MID$(BIOS$,5,1) = CHR$(AH)
2030 MID$(BIOS$,7,1) = CHR$(BL)
2040 MID$(BIOS$,9,1) = CHR$(BH)
2050 MID$(BIOS$,11,1) = CHR$(CL)
2060 MID$(BIOS$,13,1) = CHR$(CH)
2070 MID$(BIOS$,15,1) = CHR$(DL)
2080 MID$(BIOS$,17,1) = CHR$(DH)
2090 MID$(BIOS$,19,1) = CHR$(INTNUMBER)
2098 ' Now find out where to call
2099 ' (Note: Jt must be a real variable)
2100 I%=VARPTR(BIOS$):Jl=PEEK(I%+1)+256*PEEK(I%+2)
2110 IF J>32767 THEN I%=Jt-65536: ELSE I%=Jt
2120 CALL I%
2130 RETURN

```



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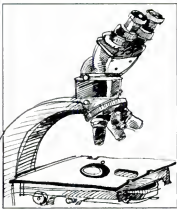
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such, the program is largely menu-driven and most menu selections are straightforward. Because the program is written in assembly, C, and compiled BASIC, the menu transitions are fast. In addition, the 160-page documentation is complete, clearly written, and easy to follow, with several useful flow diagrams.

CRS handles data in stages. To begin, you define the study design and variables. You then may enter data along with the time of data collection. Version 2.0 allows entry of 17 variables (one variable group) at a time. But a future version will include routines that allow you to link multiple variables in entry sequences.

CRS lets you display and print data in several ways, including bar graphs, scattergrams, and line graphs.

In a multi-user system, you can protect your data by requiring a password that you define—unique to each study—for accessing the data. A future update will improve data security measures.

Patient Profiles

Using logical criteria, the query function will retrieve patient data defined by the appropriate criteria. You can, for example, call up the study data concerning patients with specific profiles, such as all diabetics over 65 years old having systolic blood pressure above 160 and receiving a particular medicine.

After the data has been summarized, you can transform it by creating a new variable consisting of a mathematical function operating on one or more existing variables. Weight in pounds, for example, can be used to generate weight in kilograms.

The main feature that distinguishes CRS from other integrated products is its statistical analysis function. This function lets you analyze summarized data in most of the ways commonly used on medical data. Because the system operates as if you understand the selection and use of statistics, the reference guide explains only how to conduct the tests

MEDICINE

but doesn't discuss their applications.

Brief reminders about the appropriate applications of each analysis would be helpful for those who deal with statistical

analysis infrequently.

Descriptive statistics available in CR\$ include the mean, standard deviation, standard error, and range. Frequency

distributions can be calculated and plotted for one variable at a time. You can superimpose a normal distribution curve if you want to know whether the data is distributed normally.

By performing a one- or two-tailed student t-test, you can analyze the differences between two populations for any interval-level variable. Any of three null hypotheses can be specified. With this feature you can, for instance, analyze the difference between the mean blood cholesterol levels of patients taking drug A versus that of patients using drug B.

The linear regression analysis does a least-squares calculation and plots the interrelationship for two variables. It yields the standard linear regression statistics and is the most straightforward way of looking at how closely associated two variables are that you think either share a common causality or have a cause-and-effect relationship. For example, it would compare the systolic blood pressures of a person lying down and one standing or of a person with an elevated blood cholesterol level and one having a heart attack.

The Mann-Whitney U-test, a powerful rank test, is the only analysis that CR\$ now performs on nonparametric data (that distributed in a nonnormal pattern). This test, which analyzes the difference between the distributions of ranked variables paired in two study samples, is useful for checking the significant differences in, for example, the responses of two patient groups to a questionnaire about a new approach to health care.

Two very useful analyses, which were left out of Version 2.0, are included in Version 2.1. The manufacturer has said the new version will allow you to cross-tabulate when analyzing the distribution of two or more categorized (nominal, ordinal, or interval) variables in a study population. This feature could allow you to tabulate the incidence of impotence in two groups of patients, one of which took an investigational drug and one of which did not. A chi-square test would

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then determine whether the patients receiving the new drug became impotent more often than the patients taking a placebo.

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Michael Crouch is an academic family physician who teaches residents and medical students, sees patients, and does clinical research in Shreveport, Louisiana.

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Modeling with 1-2-3: The RAND Command

The RAND random number generator in 1-2-3 can help you turn your spreadsheet into a realistic financial modeling tool—or it can help you play blackjack against the computer.

The power of 1-2-3 is great, but it is surprising how few people have mastered its more subtle capabilities. If you learn to use some of 1-2-3's more esoteric functions, you can change a simple spreadsheet into a sophisticated model worthy of an experienced programmer—or even into a game of blackjack.

One such 1-2-3 function, RAND, can be manipulated to improve your financial analyses and decision making. To explore the use of the RAND function, at the end of this article I have included a model that simulates a blackjack game. It illustrates ways of improving your financial analysis.

Many elements of financial analyses lend themselves to the use of random number generation, including Monte Carlo simulation. For example, assume you are working on a project for which you need to predict the annual inflation and interest rates for the next 10 years. The typical way to account for these variables is to make a basic assumption that you apply throughout the cash flow analysis, such as that inflation equals 4 percent.

Variability

In most financial models, the timing of variable factors affects the outcome. For example, assume you predict 4 percent inflation for the next 10 years. You could



apply annual inflation factors in a number of ways, each averaging 4 percent over 10 years. In most cases, each scenario would result in a different answer when applied to other worksheet factors. Which is the best answer for your 4 percent assumption?

Let's Be Realistic

Assuming an average 4 percent inflation rate over the next 10 years and applying it in each year of the analysis results in a one-point per year estimate. The world and economy are hardly going to sit back and maintain this constant relationship for the next 10 years.

Instead, why not take the analysis one

step further and randomly generate inflation rates that average out to near the assumed 4 percent inflation rate over the next 10 years. By running several quick calculations, you can derive a set of outcomes from which you can determine a broader range of estimates and plot a frequency distribution. This technique may not be a perfect solution, but it does offer you more information on which to base decisions. If nothing else, you should be able to gain a better understanding of how variable your outcome is likely to be and the possible high and low values you might get while maintaining nearly the same basic assumption.

(continued)

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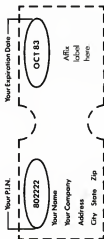


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Randomizing

With the RAND function, you can quickly generate several scenarios, each closely averaging 4 percent. By setting up random inflation factors (see listing at right), you can generate rates between 0 and 8 percent. Use 1-2-3's /RFP command and two decimal places. Each time you run a new calculation using the random table, new rates are generated and your outcome changes. By recording the results of a series of these outcomes, you gain an appreciation of a broader range of possible results.

1985	RAND*.08
1986	RAND*.08
1987	RAND*.08
1988	RAND*.08
1989	RAND*.08
1990	RAND*.08
1991	RAND*.08
1992	RAND*.08
1993	RAND*.08
1994	RAND*.08

It is important to understand certain standard statistical relationships when you are generating random numbers. For

@RAND FORMULA	LOW	HIGH	AVERAGE
@RAND*.08	.00	.08	.04
@RAND*.10-.01	-.01	.09	.04
@RAND*.12-.02	-.02	.10	.04
@RAND*.10	.00	.10	.05

Figure 1: These RAND statements produce different high-low values.

```
A1: @ROUND((RAND*13+.5),0)
C12: (GOTO)D1~/RED1.F6~
C13: /C(ESC)(HOME)^(EDIT)(CALC)^
C14: (RIGHT)(RIGHT)/C(ESC)(HOME)^(EDIT)(CALC)^
C15: (DOWN)(LEFT)/C(ESC)(HOME)^(EDIT)(CALC)^(CALC)(DOWN)
C16: (GOTO)L1^(GOTO)O5~
C18: (GOTO)F2~
C19: /C(ESC)(HOME)^(EDIT)(CALC)^(CALC)(DOWN)/XIP10>16~/XG\0~
C20: /C(ESC)(HOME)^(EDIT)(CALC)^(CALC)(DOWN)/XIP10>16~/XG\0~
C21: /C(ESC)(HOME)^(EDIT)(CALC)^(CALC)(DOWN)/XIP10>16~/XG\0~
C22: /C(ESC)(HOME)^(EDIT)(CALC)^(CALC)(DOWN)/XIP10>16~/XG\0~
C23: /C(ESC)(HOME)^(EDIT)(CALC)^(CALC)(DOWN)/XIP10>16~/XG\0~
C25: /WDE(GOTO)L1~
C27: (GOTO)D1^(END)(DOWN)(DOWN)~/C(ESC)(HOME)^(EDIT)(CALC)^
C28: (CALC)(DOWN)(GOTO)L1~
O1: "HE
O2: "----
O3: @IF(D1>10,10,D1)
O4: @IF(D2>10,10,D2)
O5: @IF(D3>10,10,D3)
O6: @IF(D4>10,10,D4)
O7: @IF(D5>10,10,D5)
O8: @IF(D6>10,10,D6)
O10: @SUM(O3..O8)
P1: "DEALER
P2: "-----
P3: @IF(F1>10,10,F1)
P4: @IF(F2>10,10,F2)
P5: @IF(F3>10,10,F3)
P6: @IF(F4>10,10,F4)
P7: @IF(F5>10,10,F5)
P8: @IF(F6>10,10,F6)
P10: @SUM(P3..P8)
N14: (ALT) S TO START NEW HAND
N16: (ALT) C TO DRAW ANOTHER CARD
N18: (ALT) D TO FINISH OUT DEALER'S HAND
```

Figure 2: A spreadsheet model simulating the game of blackjack.

FINANCE

example, it is unlikely that the average inflation rate for any one calculation in the chart is exactly 4 percent. In effect, you are only telling the program to generate inflation rates between 0 and 8 percent; you aren't saying that the average inflation rate is 4 percent. If you use more random numbers to come up with a desired average, you can reduce the variability of the distribution around that average.

By adjusting the RAND formula, you can control the range and high-low values of the random numbers while trying to obtain a desired average for your outcome. Figure 1 shows a few examples of how you can control the RAND function.

Blackjack

Just as with many other features of 1-2-3, the RAND function can be used in several different ways, for business and for pleasure. The model in Figure 2 simulates the game of blackjack. It may be less practical than financial Monte Carlo, but it's at least as much fun.

In this model, the RAND function generates numbers between 1 and 13. All random numbers between 11 and 13 (assumed to be equivalent to jacks, queens, and kings) are converted to 10. My random formula is a single line of code:

`UND (RAND*13+.5,0)`

Enter the contents of Figure 2 into your worksheet. Use the /WGPE command to protect the whole worksheet. Then remove the protection from cell A1 and range D1.F6. Use /RNC (Range, Name, Create) to identify the following macros:

Range Name	Range
\S	C12..C16
\D	C18..C23
\Q	C25..
\C	C27..C28

Save your worksheet and then retrieve it. Play a few hands, and, with experience,

you will gain a better respect for the RAND function.

Good luck, but my bets are on the dealer. ■

James Boswell is a financial and systems analyst for C.A.C.I., Incorporated, a consulting firm located in Arlington, Virginia.



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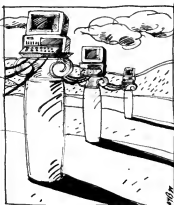
Law firms can substitute modems for the local area networks of the future. They help attorneys and staff share information and services, saving money, time, and effort.

In the ideal law office of the future, large computers, micros, word processors, telephones, printers, disk drives, mass storage files, and all other digital devices will be interconnected in one integrated network, allowing attorneys and support staff to share services and information. IBM recently announced several network technologies (local area networks or LANs), but these large-scale systems are still 2 or 3 years away. Even then they may not support non-IBM equipment. And they will surely be expensive.

An Alternative to LANs

In the meantime, modems offer a low-cost, efficient solution. Attorneys and support staff equipped with PCs, modems, and communications software can function as an efficient team, sending documents back and forth and sharing useful peripheral devices otherwise not worth the cost. Using proven, available technology, modems even facilitate some communication functions not performed by networks, notably in-house communications and access to external computers, including databases (see "On-Line Libraries," *PC*, Volume 3 Number 11).

Often different members of a firm draft various sections of documents. Securities registration statements, for ex-



ample, are often broken into parts and divided among a team to register them quickly. They can be expedited if lawyers can refer to their colleagues' drafts while writing their own sections. Other long, specialized documents can also be prepared more quickly if attorneys exchange preliminary drafts. And team drafting helps during litigation, allowing lawyers, under tight deadlines, to file briefs citing new precedents and recently discovered facts.

Lawyers often must quickly execute documents that involve other outside parties—contracts negotiated in corporate departments, for instance. Drafts can be sent between the parties' lawyers

via modems, allowing both sides to make the necessary changes and agree quickly on a final draft. When modem-equipped paralegals also share files with attorneys, delegating support work and collaborating on projects become much easier.

For example, a paralegal might set up and enter certain antitrust data, which an attorney could then selectively access through an integrated spreadsheet/graphics package to create graphs for a presentation to his or her client.

The Word of the Law

Many courts require legal petitions from law firms to be typeset. Before firms could afford laser printers, they were obliged to pay legal print shops to typeset all their petitions. However, now that laser printers are in the \$3,500 price range, even medium-size law firms can afford them. Attorneys can now cut down their turnaround time to meet late deadlines on rush documents.

Other input and output devices that a firm probably would not purchase for every attorney can be economically shared via modems—letter quality printers, tape drives, digital cameras, and digital plotters. Plotters, for example, are not often found around law firms. But with integrated spreadsheet/graphics packages, lawyers can use them to produce multi-colored graphs and color transparencies

(for overhead projectors) to enhance presentations.

Plotters are particularly useful in merger cases and tax work. Antitrust specialists use graphs to interpret economic data in merger cases to analyze market concentration for corporations, among other factors. Tax specialists can demonstrate the effects of alternative tax strategies for clients. For example, they can analyze alternative investments using stacked bar graphs to ascertain their effect on the minimum income tax or capital gains tax. They can also graph the tax effects of various depreciation and royalty depletion strategies.

The law office of the future will probably include a digital camera or document reader that can photograph any document or graphic display a lawyer is researching. With appropriate commands, this

The law office of the future will probably include a digital camera or document reader.


picture can be placed into the memory of the computer, stored on disks, and reproduced at any future time. The camera adds efficiency because it enables the computer to access large numbers of documents easily and accurately.

Although a few law firms own large minicomputers to handle vast amounts of information, smaller firms can also deal with great volumes of data by adding a tape drive to their PCs that can process

the same tapes used on mainframe computers. These drives, designed to be run with micros, are useful for storing lengthy depositions. They can also access data from the Census Bureau and other sources, formerly available solely via mainframe.

With shared peripheral devices, attorneys can compose letters and send them to a central PC for editing, filing, indexing, and letter quality printing. In this manner, the professional staff saves considerable time because the support staff does the actual processing and filing.

Computers linked by modems can also be used to send electronic messages between offices. Unlike phone calls, these messages do not interrupt lawyer-client consultations or disturb concentration. Lawyers can even confer confidentially via their PCs with colleagues in other of-



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fices on matters pertaining to clients who are with them at the time.

Of course, electronic messages can be sent most efficiently if office computers are hooked to separate interoffice telephone lines. Since most law firms own their own intercom lines, additional telephone costs for separate computer connections would be modest.

To send electronic messages, the attorney calls up a communications program and initiates auto-dial and auto-answer by typing the appropriate dial code. The receiving computer automatically displays the message if the communication program is running and the modem has been given the appropriate command to auto-answer the telephone.

During trials, lawyers can send queries from distant courthouses with briefcase-size portable computers. Of course,

the portable computer must have either a built-in modem, as the latest models do, or a serial interface into which the modem can be plugged. A central PC can be dedicated to be in answer mode at all times. Messages can then be directed to the central machine with less effort than to the peripheral computers, which might be in use.

Selection and Installation

Auto-dial, auto-answer modems work best in a law office environment. They include a processor that executes a series of commands you program from the computer keyboard. Internal or external modems are equally acceptable, as are 300- or 1200-baud models.

A communications program should serve your needs. It must support auto-answer and auto-dial features. It should

also have a dialing directory that permits disk storage of telephone numbers and the communication parameters required for each listing. In addition, the program should be able to store passwords for on-line databases, such as Lexis and Westlaw.

Although large law firms with more shared devices and more computers may derive greater cost savings by installing additional modems, smaller firms can also benefit. Such tasks as research contract negotiation are enhanced by automation in any size law firm. ■

Werner Grunbaum has taught at the University of Missouri-St. Louis since 1967. His areas of interest include graphics, environmental law, tax planning, trust management, and simulation of judicial decision-making.

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Hyped-Up Authoring

Although it's likely that authoring systems will continue to be only marginally popular, HyperGraphics, a capable product useful for more than multiple-choice quizzes, may buck the trend.

Authoring systems for microcomputers never have been particularly big sellers. They are widely perceived as useful chiefly to secondary school teachers for a fairly limited group of applications—creating multiple-choice quizzes and drill-and-practice sessions.

HyperGraphics is an authoring system with potential well beyond multiple-choice quizzes. You can, for instance, use it to design attractive user interfaces for other software or, to a limited extent, to create on-line tutorials that simulate the operation of other programs.

Simplicity of use is one of the great virtues of *HyperGraphics*. Although it isn't menu driven, the program requires that you learn only a few simple commands. The accompanying documentation serves well as a quick reference.

The first step in creating a courseware



module is to format the file you will use to store screens and branching logic. The 300K file of the authoring system will supply between 200 and 500 independent screens. The number of screens available will depend on the type and amount of information on each. Since a screen with graphics will take up more memory than one with text, the more graphics used, the fewer independent screens available.

Two distinct editors—one for text mode and one for both graphics and text—are available. For screens that contain any pictorial content, you must use the graphics editor.

The drawing functions in *HyperGraphics* include line, rectangle, circle,

free-form, and color-fill—the basic elements needed to produce just about any kind of picture. Deletion of individual components within a drawing is a tedious process; the drawing must be recreated from scratch each time you delete an element. In some situations you can speed up this process by using a special key sequence that lets you delete all the material that was put into a drawing between a given point in the drawing sequence and the end.

Color Dress Up

The program's excellent drawing and painting capabilities allow you to spruce up your presentation with color visuals,



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EDUCATION

and primitive animation is possible.

You are not limited to presenting entire screens all at once: the program allows you to specify points in the display of text and graphics where the user would have to press a key to bring up the next bit of information. You can also set things up to appear on-screen after a 3-second delay with no user intervention.

You can direct *HyperGraphics* to branch to an external executable module, which can be an .EXE file created by a compiler for any language you choose. Whenever you desire a series of events outside the capabilities of the authoring system, you can specify a call to the external program. When that program ends, execution reverts automatically to *HyperGraphics*, thereby returning users to the point at which they exited.

Some Bugs

I found some odd quirks in *HyperGraphics*. At times, I lost my work by hitting the wrong keys. This happened more than once while editing a drawing—an operation requiring shifting in and out of the Insert mode. I rebooted accidentally by hitting keys near the Ins key and the numeric keypad, not by striking the standard Ctrl-Alt-Del combination.

In one case, I stored such an accidental key sequence with a screen. What happened was that every time the program branched to that screen, the system would reboot. I had no opportunity to erase and recreate the offending screen, so eventually I simply entered instructions to branch around it.

I noticed another minor annoyance when using the color-fill function for situations in which several line-drawn figures overlapped. Depending on where you place the cursor inside the empty figure, *HyperGraphics* may not follow instructions and may not find any boundaries, except the screen's borders.

Room for Improvement

Although *HyperGraphics* measures up, a few easy-to-implement enhance-

ments could improve it considerably. A command for duplicating an area that's already been drawn would save users valuable time and could be combined with animation.

Another useful enhancement would be greater control over automatic object materialization. As things now stand, mate-

The program allows you to spruce up your presentation with color visuals.

rialization occurs automatically after 3 seconds. Because most users will hit a key to bring on the next event before 3 seconds have elapsed, successive keystrokes are stored in a buffer and retrieved by *HyperGraphics* in rapid-fire order. Ideally, users could vary the materialization rate or control the rate at which characters are released from the buffer. A related feature would prevent the buildup of keystrokes in the buffer by refusing to accept a user prompt for anything other than the very next event.

In addition, *HyperGraphics* could have more flexibility if it had a facility to branch to an author-specified screen based on a string match. This would be especially helpful for simulating software that requires the user to enter a certain command before performing an action. For example, if a user typed LIST, the software would branch to a screen representing a file listing.

The excellent graphics facilities of *HyperGraphics* distinguish it among authoring systems. In the hands of someone with moderate or better artistic skills, it can produce courseware that is much more engaging than the traditional products of authoring systems. ■

Gregory Dunn is a programmer and technical consultant who lives in Austin, Texas.

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SS DD . . . 32	Berkeley by Interlog . . . 2799
DS DD . . . 37	QUADRAM • TECH •

CONTROL DATA

SOFTWARE

FOR PC & XT	APPLE
Q2 by Fox & Geller . . . 219	Office III by Ash/Tate 419
Quick Calc . . . 299	Friday by Aston-Tate 199
FrameWork by . . . SALE	Bottom Line Strategist 269
Draw II . . . 195	DealPackets (vols) . . . 39
Friday . . . 195	CVA Modules 1 thru 4 . . . 174
Power by Hayes . . . CALL	EO by Fox & Geller . . . 319
Lotus 1-2-3 . . . 275	Enterprise . . . 197
Mayday by Telech . . . CALL	Sales Edge . . . 124
Symphony by Lotus . . . SALE	Formfile . . . 109
Upgrades for 1-2-3 . . . CALL	Knowbase . . . 64
Verio . . . CALL	Master Tips . . . 37
When Any by Dow Jones	Micro Pro . . . CALL
Master Analyst . . . 349	Micro Soft . . . CALL
Market Manager . . . 219	Pro Access (vols) . . . 49
PF5 Access . . . 65	Pro File II . . . 64
PF5 File . . . 65	Pro File III . . . 64
PF5 Wise . . . 89	The Handfile (vols) . . . 149
PF5 Report . . . 84	Tarmin Logo . . . 99
Barkham Writer . . . 47	VenaFlow . . . 259
EasyWriter II w/15 . . . 269	BPI GL . . . 267
Dow Jones Cal . . . CALL	Pie Writer by Hayden 97
Volunteer Data . . . 179	Persona Panel . . . 194
R Base by Microfilm . . . 319	Do Jones . . . CALL
WordStar . . . ON SALE	Lock Smith . . . 76
MSBI Real World . . . CALL	Lock Smith . . . 76
TLM . . . 329	Lock Smith . . . 76
VenaFlow . . . 279	Lock Smith . . . 76
Call for Complete Price List	Flight Simulator II . . . 37
	Apple Report . . . 74

MONITORS

Roland DG-121-G . . . 139	Quadrachrom w/ Card . . . 550
Roland DG-121-A . . . 249	Zenith 131 . . . 319
Roland CG-341 . . . 219	Zenith 132 . . . 487
Roland CG-141 . . . 495	Zenith 132 . . . 109
Texan 420 . . . 389	Amdek 318 . . . 159
Texan 400 . . . 119	Amdek 318 . . . 397
Texan 415 . . . 499	NEC PC 3215 . . . 369
TCB-800 . . . 139	NEC PC 3216 . . . 397
RGB Card II . . . 89	Amdek 300 C . . . 134
Quadrachrom . . . 559	Amdek 300 A . . . 144

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CIRCLE 213 ON READER SERVICE CARD

HARDWARE

PERSTOR Hard Disks

A line of expansion hard disks in 12-, 20-, 26-, and 40-megabyte capacities, each with a 5-megabyte removable Winchester cartridge. Among the models are TOP SECRET, which features dual removable cartridges allowing all data to be removed from the system for security, and an XP option, which includes an expansion chassis with a 130-watt power supply.

Each PERSTOR system includes cabinet, power supply, controller, cartridge, ca-

ble, software, and manuals.

(List Price: \$2,795-\$5,495, depending upon model)

Systems and Software, Inc.
7825 E. Redfield Rd., #C
Scottsdale, AZ 85260
(602) 948-7313

CIRCLE 722 ON READER SERVICE CARD

EXSELL

A hardware/software package for sales, marketing, and telemarketing professionals. EXSELL combines the data management functions of its software with an auto-dialing telephone to create an automated telemarketing workstation.



EXSELL, Excalibur Sources, Inc.

The EXSELLATOR phone includes a built-in speakerphone and a jack for a separate headset. The features permit the user to make calls without having to touch the phone, thus leaving the hands free.

The EXSELL software organizes the user's customer and prospect database, providing rapid access to a variety of stored information for each prospective call. Information that can be called up prior to a call includes a personal profile, contact history, comment file, and two user-definable history fields. The personal profile allows the user to store six user-defined codes, the date of "next" and "last" contacts, plus brief user notes.

An incorporated "tickle" feature reminds the user when prospects are to

be contacted for follow-up and offers a simple method for updating the status of each call. Once contact is made, the contact history is automatically updated and a follow-up report is generated to ensure that the promised action for a client has been taken. EXSELL includes data search facilities and can generate a variety of reports and mailing lists. It also interfaces with most word processing systems.

(List Price: Complete system, \$750; software only, \$495)

Requires: 128K RAM, two 320K drives, PC-DOS, asynchronous communications adapter.

Excalibur Sources, Inc.
P.O. Box 467220
Atlanta, GA 30346
(404) 395-0306

CIRCLE 732 ON READER SERVICE CARD



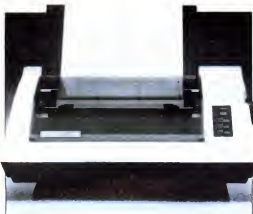
PERSTOR Hard Disks, Systems

and Software, Inc.

Axiom GP-550PC

A low-cost dot matrix printer with draft and near-letter quality print modes. In draft mode, the printer is capable of speeds up to 86 characters per inch with six different character sets: pica, expanded pica, elite, expanded elite, condensed, and expanded condensed. In its near-letter quality print mode, the Axiom GP-550 operates at 43 cps with additional character sets: italic, expanded italic, superscript, subscript (standard or expanded), proportional, and expanded proportional. In graphics mode, the unit produces a resolution of 16 vertical dots.

The printer has both pin-feed and friction feed, plus bottom feed for label forms. It uses replaceable ribbon and ink cartridges.



Axiom GP-550PC, Axiom Corp.

(List Price: \$299; with interface, \$319)

Axiom Corp.
1014 Griswold Ave.
San Fernando, CA 91340
(818) 365-9521
TWX: 910-496-1746

CIRCLE 735 ON READER SERVICE CARD

Access PC

A portable, two-way communications system allowing the user to input data from remote locations via radio transmissions. Access PC consists of a receiver module that links to an RS-232 asynchronous communications (COM1) port in the user's system and a separate handheld transceiver keypad with LED readout. The receiver interface appears as a modem to the user's system, translating incoming radio transmissions into



Access PC, Accumation

readable digital code.

Included with the system are an inventory management program and linkable software modules for using Access PC with the user's own BASIC, C, or assembly programs. Also included are software interfaces for a number of popular applications software such as dBASE II.

(List Price: under \$5,000)

Requires: 128K RAM, one disk drive, PC-DOS 2.0, asynchronous communications adapter.

Accumation
P.O. Box 855248
Richardson, TX 75081
(214) 690-3233

CIRCLE 739 ON READER SERVICE CARD

Info-Mate 1200

A standalone, 1,200-bps modem conforming to

Hayes protocols. Features include auto-dial/auto-answer modes and auto-speed selection. The modem also has a built-in speaker so the user can monitor the progress of auto-dialed calls.

The Info-Mate 1200 also allows the user to turn down the volume of its speaker, in which case the unit sends messages to the user's screen (CONNECT, BUSY, RINGING, VOICE, for example). The quiet call-progress messages also enable an electronic mail system to deliver messages unattended overnight.

The modem can operate in either asynchronous or 1,200-bps synchronous communications modes, and can multiplex voice and data communications



PC Connection, Anderson Jacobson

on the same line.
(List Price: \$595)
Cermetek Microelectron-
ics, Inc.
1308 Borregas Ave.
P.O. Box 3565
Sunnyvale, CA 94088
(408) 734-8150

CIRCLE 734 ON READER
SERVICE CARD

PC Connection

A plug-in modem board capable of operating at 300 or 1,200 bps in Bell 103/113 or Bell 212A protocols. It features full- or half-duplex operations, as well as auto-dial/auto-answer modes, and pulse or tone dialing. Two modular jacks permit both voice and data communications through one system.

Also included on the board is an asynchronous communications adapter, eliminating the need for a separate async port while allowing simultaneous data

capture and printing while recording. Bundled with the board is the *Crosstalk XVI* communications program, allowing up to 40 user-programmable function keys to speed communications procedures.
(List Price: \$495)
Anderson Jacobson
521 Charcot Ave.
San Jose, CA 95131
(408) 945-9030

CIRCLE 737 ON READER
SERVICE CARD

SCORBOT-ER III

An educational hardware/software system for learning robotics. Included within the package is the SCORBOT robot, a controller unit with RS-232 interface, and disk-based educational software.

The centerpiece of the educational package is the SCORBOT robot arm, which realistically emulates the capabilities of industri-

al robots through its physical design and the functionality of the ELITE language. The robot has a DC servo motor drive, operates on five axes, and is equipped with a gripper mechanism. The robot's controller unit has eight inputs and eight outputs that allow the robot to interact with external devices.

The *SCORBOT-ER III* software consists of four modules, ranging from a study of robotic fundamentals through more-advanced engineering concepts and experimentation. The program's curriculum combines the use of textbooks, hands-on activities, and audio-visual materials for classroom use.
(List Price: \$3,625)
PREP, Inc.
1007 Whiteshead Rd. Ext.
Trenton, NJ 08638
(609) 882-2668

CIRCLE 719 ON READER
SERVICE CARD



SCORBOT-ER III, PREP, Inc.

SOFTWARE

Rental Manager

A general-purpose property management program that handles all tenant activities, automatically posting a built-in general ledger. The flexibility of the program allows the user to determine the level of complexity, from simple control of receipts and disbursements by property, to more complex financial reporting for owners with several properties. *Rental Manager* also features interfaces to popular spreadsheet and word processing software.

(List Price: \$750)
Requires: 128K RAM,
two disk drives, PC-DOS.
Coleman Business Systems
3654 Arcadian Dr.
Castro Valley, CA 94546
(415) 581-7125

CIRCLE 729 ON READER
SERVICE CARD

SOFTWARE

GPSS/PC

An implementation of the *General Purpose Simulation System (GPSS)* modeling language originally developed for mainframe systems. *GPSS/PC* provides a simulation environment making it possible to predict the effects of managerial or engineering decisions on complex real-world systems. A prior familiarity with the mainframe version of *GPSS* is required for the most effective use of the micro version.

(List Price: \$900)

Requires: 256K RAM, one 320K drive, PC-DOS. Minuteman Software
P.O. Box 171
Stow, MA 01775
(800) 343-0664
(800) 322-1238 in Mass.

CIRCLE 715 ON READER
SERVICE CARD

Perishables Management System (PMS)

A menu-driven program for small to medium-size independent supermarkets. *PMS* provides management facilities for controlling meat, produce, and deli departments within a supermarket or within a wholesaler's distribution center, from which several stores can be controlled.

The software allows the user to analyze in detail the profitability of departments via a variety of reports. Information that can be ob-

tained via reports include tonnage, store sales, department sales, customer counts, labor costs, and other factors affecting the day-to-day business of a supermarket's operations.

Also included with the program is a separate module for performing meat-cutting tests, allowing the user to compare three different pricing levels at once before cutting.

(List Price: \$2,800)
Requires: 256K RAM, 10-MB hard disk, PC-DOS 2.0.

Supermarket Data Systems, Inc.
95 Spring St.
P.O. Box 398
Auburn, ME 04210
(207) 782-5061

CIRCLE 726 ON READER
SERVICE CARD

ASSIST/I

A program that allows IBM System/370 Assembler language applications to be written, assembled, and executed on a PC.

ASSIST/I supports an operationally complete subset of the System/370 Assembler, providing the pseudo-instructions XREAD, XPRINT, XDEC1, and XDEC0. An interactive debugger is automatically invoked either upon abnormal program termination or at user-defined breakpoints, allowing the user to view and modify the application program's memory area, registers, and Program Status Words (PSW). *ASSIST/I* will also display tables of an application's last ten executed instruc-

tions or branches; it can dynamically set and clear breakpoints and can execute instructions one line at a time.

Included with the software is a full-screen text editor that uses familiar *WordStar* commands in a nondocument mode. The source listing and output of user-created programs are written to disk where they can be read through the use of the *ASSIST/I* editor or any other host utility.

(Initial Fee: \$1,600; yearly thereafter, \$1,200)

Requires: 128K RAM, one drive, PC-DOS 2.0. Overbeek Enterprises
P.O. Box 726
Elgin, IL 60120
(312) 697-8420

CIRCLE 728 ON READER
SERVICE CARD



GPSS/PC, Minuteman Software

SOFTWARE

Fontrix 2.0

A graphics program making use of extended disk-accessing techniques to create graphics images that can be up to 1.8 megabytes in size while needing only the normal 16K RAM used by the PC to display a graphics image. *Fontrix 2.0* includes three modules—Graphic Writer, Font Editor, and Graphic Printer—to facilitate the drawing, typesetting, and printing of created images. All of the program's functions are menu-driven, with a list of pertinent commands displayed on-screen. Help screens are available at any time with the press of a single key.

The Graphic Writer module commands and coordinates the virtual graphic worksheet, allowing text and graphics images to be merged easily. Features such as italics, boldfacing, and negative type are accessible from the software's menus with single keystrokes. The drawing and painting routines accept input from either the keyboard or a mouse, and objects or the cursor can be positioned both visually and by x and y coordinates. The Graphic Writer's imaging tools include 96 foreground/background patterns, elastic lines and boxes, freehand drawing, and rectangular area fills,

as well as the ability to capture, move, and duplicate portions of a screen.

Fontrix 2.0's Font Writer module allows the user to custom-design fonts. The editor provides a 48-by 48-pixel character cell size to facilitate the creation of a new character, and features such as copy and overlay simplify the creation of similar characters.

The third module, the Graphic Printer, dumps single and extended graphics screens to a range of popular printers, including Epson, Mannesmann Tally, Okidata, IBM, and C. Itoh. Features include independent horizontal and vertical magnifications, 90-degree rotation, negative image, justifications, and multiple copies.

In addition to the main *Fontrix 2.0* package, preprogrammed font libraries, called *Fontpaks*, are available as companion disks. Each *Fontpak* contains an additional 10 fonts.

(List Price: \$125; Fontpaks, \$20 each)

Requires: 256K RAM, one disk drive, PC-DOS 2.x, color/graphics adapter.

Data Transforms
616 Washington St.
Denver, CO 80203
(303) 832-1501

CIRCLE 708 ON READER SERVICE CARD

The Factory

A logic and problem-solving game for students in grades 4 to 9. Using color graphics and animation, the game places students in the role of a design engineer, challenging them to create geometric "products" on a simulated machine assembly line they create.

Compatible with the IBM PCjr, *The Factory* is layered with three difficulty levels. Students work through each level, learning to analyze a process and to work backwards and understand sequence, logic, and efficiency. (List Price: \$55)

Requires: 64K RAM, one disk drive, PC-DOS 2.1.
Sunburst Communications Inc.
Pleasantville, NY 10570
(914) 769-5030

CIRCLE 710 ON READER SERVICE CARD

JAWS

A dental practice management system for the PC-XT, capable of organizing patient records, accounts receivable, appointment scheduling, and more. *JAWS* can prepare patient billing statements instantly, with all charges noted and all discounts (such as for senior citizens, union plans, etc.) taken into account. It can also perform income analyses for a practice by pinpointing sources of revenues and produce

correspondence through a built-in text editor. (List Price: \$2,100; demo disk, \$150)

Requires: 256K RAM, 10-MB hard disk, PC-DOS 2.0.
Pentastar Corp.
1992 Yonge St., #301
Toronto, Ont.
M4S 1Z7 Canada
(416) 485-8267

CIRCLE 725 ON READER SERVICE CARD

PC Mail Order System

A set of programs for managing a mail order business. Included utilities allow the user to log sales and print sales data reports (including tax liabilities), to print sophisticated mailing labels tied to the database, and to maintain inventory control.

Sales can be logged into the system's database by item, date, customer, serial number, quantity, tax rate, discount rates, and prices. Inventory control information that can be kept under the *PC Mail Order System* includes stock on hand, stock on order, and reorder/purchases data. (List Price: \$295)

Requires: 64K RAM, two disk drives, PC-DOS.
*Data*Easy*
12 Skylark Dr., #18
Larkspur, CA 94939
(415) 927-0990

CIRCLE 717 ON READER SERVICE CARD

SOFTWARE

Compiler Assist Program (CAP)

A utility program for IBM Pascal programming. *CAP* analyzes the results from *PAS1* and *PAS2*, setting the *DOS ERRORLEVEL* after each pass. This allows a batch file to check the *ERRORLEVEL* from one step before continuing on to the next. If errors are found, the compiler screen output is locked until the user has examined it. Also included with the software is a utility that allows a batch file to prompt the user for the actions to be taken upon a *PAS1* or *PAS2* failure.

(List Price: \$27.50)

Requires: 128K RAM, one disk drive, PC-DOS 2.0, IBM Pascal Compiler. *Slick Software*
P.O. Box 641
Harrisburg, NC 28075
(704) 455-5927

CIRCLE 731 ON READER SERVICE CARD

MISys

A manufacturing inventory system geared to the needs of small to medium-size businesses. *ISys* provides inventory control, multiple-level bills of material, and an integrated purchase order processing system. The software can produce over 40 different management reports. Designed to be functionally compatible with the *Easybusiness* line of software from Informa-

tion Unlimited Software, *MISys* integrates directly with the *EasyFiler* database management system.

(List Price: \$995; demo disk, \$100)

Requires: 128K RAM, two disk drives, PC-DOS. *Microcomputer Specialists, Inc.*
18 Lyman St.
Westboro, MA 01581
(617) 366-1200

CIRCLE 716 ON READER SERVICE CARD

Type Processor One

An interactive typesetting program allowing text to be composed via a "what you see is what you get" display. *Type Processor One* consists of two integrated modules: text processing (formfill) and composition. The text processor allows the user to "draw" sets of columns on the screen with indents and runarounds. The program will then accept ASCII text from any word processing program to fill these columns, automatically justifying and hyphenating from a 20,000-word dictionary.

The composition module displays simulated type on the computer screen. The user can directly change size, type font, position, and so forth, "draw" horizontal and vertical rules for generating complete forms, and "cut and

paste" blocks of type.

Output can be sent to typesetters either through a direct RS-232 serial link or over the phone. Hard copy can also be generated locally for proofing purposes.

(List Price: \$4,995)

Requires: 256K RAM, two disk drives, PC-DOS. *Bestinfo, Inc.*
33 Chester Pike
Ridley Park, PA 19078
(215) 521-0757

CIRCLE 733 ON READER SERVICE CARD

Flow Charting

Software to create, edit, store, and print out programming flowcharts and organization charts. *Flow Charting* includes two text fonts, standard flowcharting symbols, and three distinct types of lines. Using full-screen editing techniques, the user

can create a chart, then print it on any standard dot matrix printer.

(List Price: \$167)

Requires: 128K RAM, one disk drive, PC-DOS, color monitor, color/graphics adapter. *Patton and Patton*
340 Lassenpark Cir.
San Jose, CA 95136
(408) 629-5044

CIRCLE 724 ON READER SERVICE CARD

Marvel Print

A utility designed to simplify the use of extended printing features of the Okidata Microline printer. The user replaces printer control codes with standard keyboard characters, as data are entered with any word processor or other software. *Marvel Print* converts the standard keyboard characters into the appropriate control se-



Type Processor One, Bestinfo, Inc.

SOFTWARE • ACCESSORIES

quences as the data are printed.

Commonly used codes, such as underlining, enhanced, emphasized, pica, elite, condensed, data processing mode, correspondence mode, and so forth, require only one character to be embedded in the text. Less common codes, such as formatting commands, require two characters. Because standard characters are used, such word processing functions as global search and replace can easily be done on the printer codes.

Marvel Print can produce microjustified text even with double-width characters. All features of the Okidata Microline printer are supported, including variable line spacing, vertical and horizontal tabs, and ASCII graphics. (List Price: \$70)

Requires: 64K RAM, one disk drive, PC-DOS, Okidata Microline printer. **Marvel Software**
1922 Ave. N
Brooklyn, NY 11230
(718) 336-2323

CIRCLE 709 ON READER SERVICE CARD

The Registrar

A registration and logistics management program for in-company training programs and similar institutions. The software includes functions for enrolling students, estab-

lishing students' statuses, and printing class rosters and student transcripts. Logistics functions include keeping track of instructor assignments, course supplies, confirmation and completion letters, invoices, and so forth.

The Registrar can merge class and student information with form letters created by the user on an outside word processor. Reports that can be prepared and printed wholly within the software include alphabetical listings of classes and students, class rosters, transactions logs, and management reports. The program can also export data in ASCII, DIF, and dBASE II formats for use with outside programs. (List Price: \$835; demo disk, \$50)

Requires: 128K RAM, two disk drives, PC-DOS. **Silton-Bookman Systems**
4966 El Camino Real,
#101
Los Altos, CA 94022
(415) 967-2660

CIRCLE 712 ON READER SERVICE CARD

Sexware

A sex education program with over 200 multiple-choice questions on a range of sex topics. Intended primarily as entertainment, the program produces a Sex IQ score based upon answers entered.

(List Price: \$29.95)

Requires: 64K RAM, one disk drive, PC-DOS. **Challenge Software Co.**
134 W. 32nd St., #602
New York, NY 10001

CIRCLE 727 ON READER SERVICE CARD

ACCESSORIES

Calc/Pad

A pad of pre ruled spreadsheet work forms, intended to aid in working out a spreadsheet's structure and contents before

entering data at a keyboard. The Calc/Pad form offers 20 rows by 8 columns, printed on both sides. Each pad contains 50 sheets of 8½- by 11-inch paper punched to fit regular three-ring binders. (List Price: \$4.75 per pad)

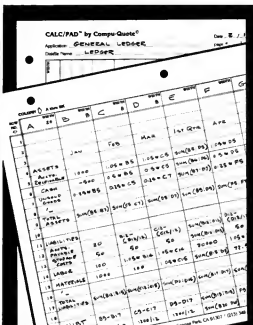
Compu-Quote

6914 Berquist Ave.
Canoga Park, CA 91307
(818) 348-3662

CIRCLE 706 ON READER SERVICE CARD

PC Caddy

A portable, self-contained workstation. Features in-



Calc/Pad, Compu-Quote

ACCESSORIES



PC Caddy, Omnium Corp.

clude individually adjustable keyboard and monitor platforms, vertical storage of the IBM PC's systems unit, and heavy-duty casters. Constructed of heavy-gauge chrome and black steel, the PC Caddy can support any monitor weighing less than 50 lbs. and having a footprint not exceeding 9¼ by 15½ inches.

(List Price: \$99)
Omnium Corp.
203 N. Second St.
Stillwater, MN 55082
(800) 328-0223
(612) 430-2060

CIRCLE 711 ON READER
SERVICE CARD

Platinum Series Diskettes

A premium-quality, universal diskette that can be used with any type of 5¼

diskette drive. The diskettes feature two data-protect notches and two index holes, allowing single-sided drive owners to flip the disk for data storage on both sides. The Platinum diskettes can also be used on double-sided drives, even those capable of storing data in quad-density. (List Price: Box of 10 disks, \$55)
Capitol Data Systems
1750 N. Vine St.
Los Angeles, CA 90028
(213) 462-6252

CIRCLE 730 ON READER
SERVICE CARD

Transport Stationery Feeder

A cut-sheet paper holder made of thin, flexible vinyl. The Transport Feeder holds letterhead stationery, preprinted forms, and other individual sheets of paper for printing on a tractor-feed printer. Once the

sheets have been mounted, they are held by the printer mechanism.

The Transport Stationery Feeder is available in 25-sheet and 50-sheet lengths. (List Price: 25-sheet model, \$29.95; 50-sheet model, \$59.95)

Richard L. Kaye
& Co., Inc.
666 Dundee Rd., #1103
Northbrook, IL 60062
(312) 564-8860

CIRCLE 736 ON READER
SERVICE CARD

Kleen Line Conditioners

A line of portable power conditioners available for 250-, 500-, 1,000-, and 2,000 watt loads. The devices can produce an output of 120 volts AC ($\pm 3\%$) from a line input voltage varying from 90 to 140 volts AC. With their 3% sine wave output, the Kleen Line Conditioners

provide continuous protection against spikes, surges, and line noise.

(List Price: 250 watts, \$292; 2,000 watts, \$977)
Electronic Specialists, Inc.
171 S. Main St.
Natick, MA 01760
(617) 655-1532

CIRCLE 713 ON READER
SERVICE CARD

PC AIRFLO

A fan/filter unit designed to fit the vent openings of the IBM PC's systems unit. The PC AIRFLO device mounts on the user's PC with a clear acrylic bracket and supplies filtered air into the PC to help cool internal expansion boards and components. Motor speed can be adjusted to supply forced, clean air at rates of up to 46 cubic feet per minute.

The unit uses any kind of air conditioning filter material. It does not require power from the PC's



Platinum Series Diskettes, Capitol Data Systems

ACCESSORIES • PUBLICATIONS

power supply because it includes its own line cord. An optional version, using the three-wire Canadian standard, is available by special order.

(List Price: \$97.94)

ABC Computer Peripherals, Inc.
77 Columbia St.
New York, NY 10002
(212) 477-1890

CIRCLE 777 ON READER SERVICE CARD

TOUCHSTONE I

A dedicated plug-compatible numeric keypad. The TOUCHSTONE I includes a separate cursor control pad and Space, Backspace, Home and Enter keys, plus a full set of math keys, including percent and brackets for compound math formulas. The standalone pad compliments the IBM PC keyboard.

Developed as a productivity tool for spreadsheet, accounting, and other number-intensive applications, the numeric keys are in the familiar calculator pad layout. The keypad's cable ends in two DIN connectors. One of the connectors plugs directly into the keyboard jack of the user's system. The other mates with the standard keyboard's DIN plug for combined operation. In this manner, both keyboards are active at all times, and data may be entered from either keyboard.

(List Price: \$169.95)

Touchstone Technology Inc.
955 Buffalo Rd.
P.O. Box 24954
Rochester, NY 14624
(716) 235-8358

CIRCLE 784 ON READER SERVICE CARD

Portable PC Computer Bag

A carrying case for the IBM Portable PC, Compaq, and other similarly sized systems. Combining the protective qualities of a hard case with the convenience of a soft case, the Portable PC Computer Bag features a large, zip-down front panel and heavy-duty reinforced handles and shoulder strap.

(List Price: \$139.95)

Kiwi Division Northern Mercantile, Inc.
6721 N.W. 36th Ave.
Miami, FL 33147

CIRCLE 751 ON READER SERVICE CARD

Voyager Anti-Piracy Devices

A line of microprocessor-based devices designed to prevent unauthorized use of software. The devices connect to the RS-232 serial port of the user's system and automatically determine the baud rates of data on the line.

Model SP200 works in conjunction with the program to be protected by supplying, upon request,



Portable PC Computer Bag, Kiwi Div., Northern Mercantile, Inc.

two unique 64-bit codes from its internal ROM.

The first code verifies that the correct SP200 unit is in place in the user's system. The second code is normally used as a key to encode and decode data. However, it can be used by software in other ways, as determined by the user.

Model SP200-64 has 64 pairs of software-selectable codes available in internal ROM. Other models in the line are designed to contain parts or all of encrypted programs, with 1K to 64K bytes of available user memory.

The devices are designed so that when not transmitting codes, data passes through the output port of the devices in a transparent mode. To prevent tampering, the devices are made of molded plastic.

(List Price: Available from the manufacturer)

Voyager Development, Inc.
412 S. Lyon St.
Santa Ana, CA 92701
(714) 667-8128

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PUBLICATIONS

Get the Most Out of CompuServe

A how-to guide to using the CompuServe on-line videotext service. Endorsed by CompuServe Inc., *How to Get the Most Out of CompuServe* gives a complete tour of the service's facilities and offers sections devoted to logging in, passwords and handles, commands used to draw data from the system, the workings of electronic mail, and so forth.

The book, by authors Charles Bowen and David Peyton, includes an on-line survival kit, with an electronic address book for major services, a bibliography of additional study materials, and instructions for reaching the authors through CompuServe. (Cover Price: \$12.95)
Bantam Books
666 Fifth Ave.
New York, NY 10103
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Inside the Personal Computer, Abbeville Press, Inc.

Inside the Personal Computer

A slick introduction to personal computers in general, featuring three-dimensional, pop-up models of a PC's components and peripherals. Designed for the average person, *Inside the Personal Computer*, by author Sharon Gallagher and graphic artist Ron van der Meer, guides the reader through a PC's hardware.

Six spreads open up to explain how a disk drive works, how a CRT screen produces images, how a keyboard works, and so forth. Accompanying charts, diagrams, and illustrations further aid in explaining the fundamental principles of personal computing.

(Cover Price: \$19.95)
Abbeville Press, Inc.
505 Park Ave.
New York, NY 10022
(212) 888-1069

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The Principles of Data Communications

A primer on data communications written to be useful to people in any stage of expertise. Through case studies and detailed explanations, the author, Richard Dolphin, covers the equipment involved, the interface standards used, and common protocol types of data communications as currently practiced.

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Madison, NJ 07940
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Mastering Symphony

An introductory guide into the intricacies of Lotus Corp.'s *Symphony* integrated software. *Mastering Symphony*, by author Doug Cobb, explains the workings of the software's spreadsheet, database man-

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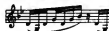
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Turbo Pascal

With the advent of Borland's popular Turbo Pascal comes the need for ways to use this powerful tool. *Tech Journal* delves into the subject of extending the power of Turbo Pascal to other programs. Pascal coverage in February also includes a review of another new product from Borland, the Turbo Toolbox, and a how-to piece on accessing the command processor's set environment from IBM Pascal.

Memory Options for PCjr

Tech Journal looks at three sidcars that increase Junior's memory with hardware reviews of PC Captain and PC Wave from Tecmar and the IBM Memory Expansion Sidcar.

Communications

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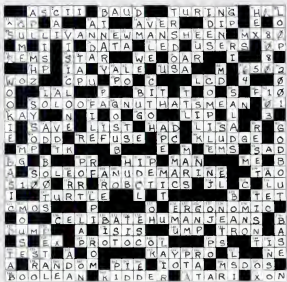
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 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750
 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775
 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800
 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825
 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850
 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875
 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900

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 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150
 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175
 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200
 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225
 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250
 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275
 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300
 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325
 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350
 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375
 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400
 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425
 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450
 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475
 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500
 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525
 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550
 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575
 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600
 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625
 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650
 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675
 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700
 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725
 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750
 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775
 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800
 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825
 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850
 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875
 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900

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PC Product Index

RS#	PRODUCT	ADVERTISER	PAGE#
DISK OPERATING SYSTEMS			
337	QIC-01	Qic Research Inc.	72
337	QIC-04	Qic Research Inc.	72
ACCOUNTING SOFTWARE			
112	Show Box Accountant	Cyma Corp.	52
260	Versa Business Series	H & E Computers	334
234	Bottom Line Five	Bar Systems Inc.	330
*	Multiplan	Microsoft	110,111
420	Real World Software	Real World Software	5
INTEGRATED ACCOUNTING PACKAGES			
*	Windows	Indian Ridge Enterprises, Inc.	11
470	dBASE III/Accounting Software	SRT Corp.	16
TAX AIDS			
114	Tax Time-1040	Austin Scientific	20
131	Tax Program	Bus Programs	99
327	Tax Preparer	Howardsoft	33
323	The Tax Surgeon	Taxbyte Inc.	243
COMMUNICATIONS SOFTWARE			
326	Crosscall	Micro Staff Inc.	221
333	Transporter	Micro Staff Inc.	21
OTHER UTILITIES			
152	Copy II PC	Central Point Software	224
514	Printworks	Softstyle	80
475	Apple Turnover	Venex Systems	66
PORTFOLIO MANAGEMENT			
407	Electronic Investment Center	Spear Securities	147
GRAPHICS SOFTWARE			
184	PhotoMac	Chromo Data Systems	39
311	PC Draw	Microgrids	82
502	PC Paintbrush Software	Tecmar Inc.	C-4

RS#	PRODUCT	ADVERTISER	PAGE#
INFORMATION MANAGERS			
212	Spotlight	Software Arts	112-113
SOFTWARE FOR PROFESSIONALS			
150	Sidkick	Borland International	12-13
120	Northeastern Software	Northeastern Software	148
335	Mother Jones Son's Software	Mother Jones Son's Software Co.	35
ENGINEERS/SCIENTISTS			
331	ROB Chip	Microway	92
STATISTICAL SOFTWARE			
521	Statpro	Wadsworth Professional SW	22
WORD PROCESSING SOFTWARE			
280	Word Processing	Leading Edge	88
350	Mini 11	Microsystems Engineering Corp.	100-103
509	XVWrite	XVQuest	357
154	Word Perfect	Satellite Software Int'l (SSI)	44, 45
WORD PROCESSORS			
305	Volkmaster Deluxe	Lifetree Software	271
534	Wordstar 2000	Micropro International	26, 27
MULTIFUNCTION SOFTWARE			
272	Smart Software	Innovative Software	114, 115
501	Treasure Chest	Tecmar Inc.	C-2
EDUCATIONAL SOFTWARE			
387	Total Telecommunications	Tele Learning Systems	223
INTEGRATED SOFTWARE			
388	Inherit	Noammon Corp.	254
494	Abdly	Xanuro Technologies, Inc.	2, 3

PC PRODUCT INDEX

RS#	PRODUCT	ADVERTISER	PAGE#
-----	---------	------------	-------

ENTERTAINMENT SOFTWARE

171	Golf Program	One Step Software	264
187	Total Telecommunications	Telelearning	223

COMPILERS

149	Borland Turbo Pascal Compiler	Borland International	21
-----	-------------------------------	-----------------------	----

OTHER LANGUAGES

353	20/20 Bar Code	Normal	37
361	Language Software	The Programmers Shop	255

DATA BASE MANAGERS

218	Revelation	Comcon, Inc.	104
525	Knowledge Man	MDBS	94, 95
*	Database Manager	Pacific & Pacific Engineering	14
193	Dataline	Software Solutions	97

PROGRAM DEVELOPER/GENERATOR TOOLS

246	Quickcode III	Fox & Geller	160
-----	---------------	--------------	-----

TEXT EDITORS

182	SPF/PC	Command Technology Corp.	272
378	Kedit	Munfield Software Group	282

OTHER UTILITIES

239	Personal Copier	Disk Tech	320
306	Sideways	Funk Software	183
136	Data Padlock	Genio Engineering	99
303	LePain	LeBough Software Corp.	234
140	Dac Mechanic	MLI Microsystems	320
175	Utility Tool	Mother Jones Son's Software Co.	55
146	Power Utilities	Norton Utilities, The	266
268	Hard Runner	Noradams	96
177	File Transfer	Personal Computer Products	224
*	Copywrite	Quad Software LTD	307
136	Padlock II	Genio Engineering	99

HARDWARE

168	Computers	Jamco Electronics	274
-----	-----------	-------------------	-----

RS#	PRODUCT	ADVERTISER	PAGE#
-----	---------	------------	-------

IBM PC COMPATIBLE COMPUTERS

237	Erisson PC	Erisson	114, 115
276	IBM PCjr	IBM Corp.	24, 25
140	Senior Partner	Panasonic Industrial Co.	38

ACCESSORY CARDS

409	Fast Card	Thyris Memory Products Corp.	63
-----	-----------	------------------------------	----

MULTIFUNCTION BOARD

540	Ultra Pak	Tecno Labs	23
101	Six Pak Plus	AST Research	84, 85
486	Quadboard	Quadram Corp.	32
356	BigPlus	Outbit	87
430	Big Plus II	STB Systems	C-3
501	Multifunction Boards	Tecmar Inc.	C-2
517	QIC-05	Qic Research Inc.	72

VIDEO/GRAPHICS BOARD

145	Hercules Graphic CD	Hercules computer technology	8
146	Hercules Color Card	Hercules Computer Technology	43
*	Modular Graphics Card	Pendix Systems	228
501	Graphics Master Board	Tecmar Inc.	C-2

OTHER ACCESSORY CARDS

256	Coaxial Board	Emulex Permyt	244
187	Color 400	Sigma Design	151
537	QIC-06	Qic Research Inc.	72

INPUT HARDWARE

250	The Light Pen Tektronix 40	FTG Data Systems	73
507	Touchscreen I	Touchstone Technology, Inc.	108

MASS STORAGE HARDWARE

247	Bubble Memory Board	Helix Laboratories	208
317	Megaflight 100	Kanematsu Labs	10
437	Race for Space	Maynard Electronics	38
373	Hard Disc Drive	Spacost Systems, Inc.	275
538	Disk Subsystem	Suicide Mutt Electronics	47
*	Disk Drive, tape Backup	Sygen Inc.	56

PC PRODUCT INDEX

RS#	PRODUCT	ADVERTISER	PAGE#
-----	---------	------------	-------

COMMUNICATIONS HARDWARE

145	2400 Modem	Hayes Microcomputer Products	161
-----	------------	------------------------------	-----

MODEM

387	Total Telecommunications	Telecam	223
372	Sony Trinitron Mount	Sony Information Systems Co.	235
109	America Modem	America	86
537	QIC-03	*Qic Research	72

NETWORKING

412	PC NET	Orchid Technology	142
-----	--------	-------------------	-----

OTHER COMMUNICATIONS HARDWARE

158	Hard Disk	Complete Management Systems	320
-----	-----------	-----------------------------	-----

DISPLAYS/MONITORS

383	Qube Hard Disk Drive	Qube	61
489	Toshiba Monitor	Toshiba	36

PRINTERS

300	Dot Max 9	Fujitsu America, Inc.	154
162	Printer	IBM ISG Division	107

DOT MATRIX

113	Printers	Citizen America Printer	30, 31
-----	----------	-------------------------	--------

PLOTTERS, ETC.

300	Plotter	Houston Instruments	152
-----	---------	---------------------	-----

PRINTER DRIVERS

175	Letter Boss	Connecticut Software	76
175	Printer Boss	Connecticut Software	76
175	Slidekick	Connecticut Software	76

RS#	PRODUCT	ADVERTISER	PAGE#
-----	---------	------------	-------

VOICE SYNTHESIZERS/SOUND RELATED HARDWARE

342	Voice Recognition Equipment	NEC America/New Product Division	17
-----	-----------------------------	----------------------------------	----

FURNITURE

199	CompuCart	CompuCart	232
-----	-----------	-----------	-----

DISKETTES

289	Dynan Diskettes	Dynan	14
517	Manell Floppy Disks	Manell Corp of America	1

SOFTWARE SECURITY SYSTEMS

508	Protok	Vault Corp	69
-----	--------	------------	----

KEYBOARD OVERLAYS

441	PC DocuMate	System Management Assoc	240
-----	-------------	-------------------------	-----

OTHER SUPPLIES

121	Dust Covers	Contemporary Computerware	320
245	Computer Supplies	Elek Tek	236
225	PC Support	Imatic	235
454	Warc Time	Network	215
148	The Rolltop 100 Disk File	Microcomputer Accessories	282
148	Tie 'N' Ties	Microcomputer Accessories	282
148	Keyboard Storage Drawer	Microcomputer Accessories	282

LITERATURE

176	Periodicals	Data Sources	262
349	The Manual	Management Information Service	279

ORGANIZATIONS & SERVICES

216	Data Decisions Microcomputer	Data Decisions	78, 79
370	NewNet	NewNet	46
*	Computer Insurance	Safarai	255

The publisher does not assume any liability for errors or omissions in the product index.

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109	Ameritec	86	121	Contemporary Computerware	320	*	Gollan Co. Inc.,	329
129	Applied Computer Products Inc.	90, 91	218	Cosmos	104	165	Hayes Microcomputer Products	161
101	AST Research	84, 85	112	Cyma Corp	52	260	H&E Computronics	334
114	Austin Scientific	20	216	Data Decisions	78, 79	247	Helix Laboratories, Inc.	208
131	Best Programs	99	176	Data Sources	262	145	Hercules Computer	8
149	Borland International	21	116	Diamond Software	77	146	Hercules Computer	43
150	Borland International	12, 13	117	Discount Computer Centers	106	300	Houston Instruments	152
102	Bullish Investment Software	330	239	DiskTech	320	327	HowardSoft	53
152	Central Point Software, Inc.	224	289	Dysan Corporation	14	162	IBM-ISG	107
184	Chorus Data Systems	29	230	800 Software	65	276	IBM-PC	24, 25
113	Citizen America Printer	30, 31	235	Eastern Enterprises	239	224	ILAR Systems	330
182	Command Technology Corp.	272	245	Elek-Tek	236	*	Indian Ridge Enterprises	11
158	Complete Management Systems	320	256	Emulex-Persyst	244	321	Industries Best Micro	276
228	Compu Add Corp	268	237	Ericsson	114, 115	225	INMAC	275
199	Compucart	232	164	Everex	131	272	Innovative Software	144, 145
205	Compuclassics	310	248	Expert Computers	272	168	Jameco Electronics	274
234	COMPUMAIL	321	242	47st Computer	318, 319	317	Kammerman Labs	10
183	Computer Mart	265	163	FORT WORTH COMPUTERS	73	280	Leading Edge	88
185	Computer Mail Order	74, 75	250	FTG Data Systems	73	303	LeBaugh Software	234
135	Computer Warehouse	330	246	Fox & Geller	160	385	Lifetree Software Inc.	271
213	Computers & More	284	309	Fujitsu America, Inc.	154	282	Logicsoft	48-50
175	Connecticut Software	76	306	Funk Software	183	349	Management Information Service	279
125	Conroy-LaPointe, Inc.	40, 41	252	Garden of Eden	237	378	Mansfield Software Group	282
			255	Gem Electronics	245	517	Maxell Computers	1
			136	Glenco Engineering	99	437	Maynard Electronics	38
						290	MCP Applications	267

Peering into the PC's Brain: Assembly Language

Two new books offer novices insight into advanced programming. One provides a good step-by-step guide, and the other doubles as a primer and a long-winded information outlet.

By any definition, assembly language is considered an advanced computer language, but Chao Chien's new book, *Programming the IBM Personal Computer: Assembly Language*, makes it accessible to novice users as well as to accomplished bit flippers. He initially assumes the reader has no previous knowledge of computer internals and then leads him by the hand down all the highways and byways of PC hardware and MS-DOS. In fact, I believe this is such a good introductory book that I would even recommend it to users who may never code a line of assembly language but who just want to peer into the living brain of a thinking machine.

For the record, I want to mention that the book refers exclusively to Microsoft's assembly language, not to CHASM

(a freeware product) or any of several other lesser assembly languages. And this is exactly the way it should be because the trick to understanding assembly language is not memorizing the oper-

and explaining the meanings of such phrases as the *thinking machine*, he provides the best of all cures for technophobia.

Though you could read this book while sitting comfortably in an armchair, I suggest you have Microsoft's ASM program handy so you can try out the exercises. DOS is the only software required. In addition, I recommend you use a better text editor than EDLIN, the one referred to in the examples.

Chien's writing style is relaxed, and he obviously enjoys talking about his favorite hobby. He sympathizes with users who are intimidated by the thought of designing a complex assembly program, confessing that he "personally cannot even walk and chew gum at the same time, much less think directly in code." Only rarely does his impeccable grasp of assembly language contrast with amusing abuses of English, such as when he describes "the DOS perching at an input mode," which means it is simply waiting for a command.

Scarebuglar Message

Unlike many textbooks, the first exercise you are asked to try turns out to be a useful program for inputting copyright information directly into your program. In this case, it is a routine called START that fits into your AUTOEXEC.BAT file



ation codes but learning how they operate. Chien occasionally even omits certain advanced features, such as macros, instead referring the reader to the Microsoft manual.

Chien starts with very lucid explanations of various number systems as well as such early calculating devices as the abacus. By showing how an electronic machine can perform addition via a simple array of AND, OR, and NOT circuits



Programming the IBM Personal Computer: Assembly Language

Chao C. Chien

Holt, Rinehart and Winston
383 Madison Ave.

New York, NY 10017

(212) 827-2000

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Cover Price: \$18.45

ISBN: 0-03-070442-1

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BOOK REVIEW

and whose only purpose is to display:

C.C. Chien's IBM PC Computer Acquired on his 40th birthday \$10,000 will be rewarded on any information leading to its recovery

Insert your own name and statistics, and you have an instant scarebuglar message. The remaining exercises are instructive and occasionally even flamboyant. For example, you draw Charlie Chaplin's hat on screen in one program.

With a glossary and index, appendixes on the 8088 instruction set and the BIOS and DOS interrupts, and a 50-page collection of useful subroutines, this book is a steal at \$18.45. Moreover, just reading through the subroutines is a great way to pick up some enormously clever assembly language techniques.

Programming the IBM PC & XT: A Guide to Languages

At first glance, the premise of *Programming the IBM PC & XT: A Guide to Languages* must have sounded like a neat idea to its publishers: give the language nuts everything they ever wanted to know about every IBM programming language written. Unfortunately, once the project was conceived, Clarence Germain obviously seems to have bypassed the critical planning stage because the end result is an unrelated hodgepodge of IBM manual abridgements.

Books comparing different programming languages, especially those offering insight into the history and folklore of data processing, are intriguing to me. Fifteen years ago, Prentice-Hall gave us Jean Sammet's *Programming Languages: History and Fundamentals*, a

thrilling romp through 100 electronic dialects. Germain's book, by contrast, is a superficial anthology of technical synopses of the major languages sold by a single software vendor for a single computer. He offers no insights, no folklore, and no cartoons.

The most I can say for this book is that it probably contains more information on its topic than any other book of its size. There are long chapters on the IBM PC in general, the 8088 instruction set, and the early history of computer hardware. The remainder tersely delineates IBM's current language offerings for the PC. Also included are appendixes, an index, and numerous photos of obsolete IBM coding forms from the 1960s.

Although most of the information is accurate, I get the feeling that it was copied from other sources without much

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BOOK REVIEW

comprehension. For example, Germain's discussion of packed data formats applies to the IBM System 370 but not to the PC, as does his remark that COBOL statements consist of "standard 80-byte records."

Germain's other boners include his claims that the cable connecting the system unit to the keyboard is nonremovable, that BASIC programs are translated to uppercase only after having been saved to disk, that expressions such as YU7(3+X) are illegal, and that pressing Ctrl-Break sends X'0000' plus "a special interrupt signal" to the computer. He even says, "We use an asterisk for multiplication since there is no times sign in the character set of computers."

I can't shake the feeling that this book was undertaken as an extra-credit term project by members of a high school computer club. Some of the bloopers are actually funny: "It is generally poor programming practice to have sub-sub-directories." It certainly is, unless, of course, you happen to know what you're doing. These flaws are compounded by the lack of purpose throughout the book; it was a serious error of judgment to include only official IBM languages. Aren't C, Modula-2, and all the rest real programming languages? Do real programmers use only IBM compilers?

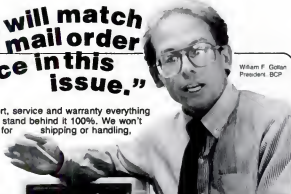
This book fails as a guide to languages because it offers no theoretical or historical perspective. It also fails as a collection of tutorials because it is ridiculous to

expect the average PC user to master so many languages. And it fails as a reference work because you would have to read a chapter at a time and because it is

often inaccurate. Also, reference works don't need tedious exercises at the end of each chapter. I'd have to give this "class project" a D minus.

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William F. Golan
President, BCP



Programming the IBM PC & XT: A Guide to Languages
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CIRCLE 135 ON READER SERVICE CARD

Throw Out Your Index Cards

Here's how to use your editing system to take notes, keep files, and build a database for research or writing projects. It's a lot more efficient than shuffling index cards.

I hated to admit it, but I was stumped. My husband Dale, a dermatologist, wanted to test a new way of using 5-Fluorouracil to treat psoriasis. But he needed a grant. To get the grant, he had to write a proposal. "Can our PC help me organize my notes?" he asked.

It sounded like a job for an index-card-style data manager like VisiCorp's *VisiDex* or Fastware's *Thor*. But Dale, a recent master of *Volkswriter*, was accustomed to the amenities of a powerful word processing program. Although I can hack some passable computer code, I knew I couldn't churn out the equivalent of a *Volkswriter* with data management abilities to boot. "The software you need isn't on the market yet," I told him. "Why not stick to using index cards?"

It Works

Dale didn't give up. He described his dilemma to one of his patients, a computer pro who sells customized business systems. "No sweat," the patient told him, proceeding to describe how to use *Volkswriter*, or any editing program with a search function (even EDLIN will do), as a primitive but effective manager of free-form data.

Here's how it works. First, using your editing program, list the main categories or subjects you will cover in your database, in alphabetical order. The list



doesn't have to be exhaustive—you can add more later.

If your PC runs DOS 2.0 or higher and you fit each title on a single line, you can use the DOS SORT filter to sort your list. For example, to sort a file called RESEARCH.DTA you would type
SORT <RESEARCH.DTA>
SORTED.DTA

SORTED.DTA will now hold your sorted list. This list, which will always appear at the top of your database, is your index. Figure 1 shows part of Dale's index. Note that he used only uppercase letters and that the first heading he employed is BIBLIOGRAPHY. You'll see

why that's important soon.

Next, skip a few lines and copy your index. Most word processors include a block copy command to let you copy your list using three or four keystrokes. (The DOS 2.0 and later versions of EDLIN also have such a command.) This second list is the skeleton of your data section. The categories function like the header titles in an index-card file box; you insert each note after the appropriate header.

Taking Notes

Now you're ready to start entering data. Use your program's search function to jump to the BIBLIOGRAPHY

WRITING

header in your data section. If you've written your headers in uppercase letters and instructed your program to pay attention to case, the search will locate the heading rather than the word *bibliography* buried in your text.

Next, record the bibliographic information about your first source. The first paper Dale read was "Topically Administered Fluorouracil in Psoriasis," number 1 in his bibliography (Figure 2).

The first item that caught his eye concerned the treatment's effectiveness. He used the editing program's search function to jump to the EFFECTIVENESS header in the data section. There he noted that 13 patients treated with 5-Fluorouracil were clear of the disease for 6 to 12 months. To keep track of the source of the information, he wrote the reference number (1) next to the citation, as shown in Figure 2. He repeated this process to record each new note.

After Dale completed his literature review, his database became the working outline for a large part of the proposal. Even the bibliography was in near-final form. He simply had to put it in alphabetical order and use the editing program's search-and-replace function to change the reference numbers.

Dale claims that the PC database has several advantages over the manual, index-card system. It organized his data by topic rather than source. It gave him a tidy set of notes. And the printout was a handy, impressive reference tool when he presented his proposal to the research committee.

The system has at least one drawback. Unless you have a portable computer, you can't take notes while you're away from your PC. Dale solved this problem by photocopying articles in the library and bringing them home to take notes.

Many other tasks that you can orga-

nize using a Rolodex or index cards also lend themselves to this kind of data management. For instance, you could use it to keep track of a simple mailing list. Each category would define a section of your list. To print mailing labels, make sure that the spacing in your list matches the spaces on the label stock.

Managing your mailing lists can become more sophisticated if your word processing program can generate custom form letters. Such programs often require that addresses in your list appear on a single line in a specified form. You can usually add some key words or categories to each address and then use the DOS FIND filter to produce a mailing list of addresses in a certain category. If you called your mailing list MAIL.LST, and you wanted a specialized list of students, you could command:

```
FIND "STUDENT" MAIL.LST >
STU.LST
```

The STU.LST file would then include addresses of people you had classified as students. This same technique works if you want to create a mailing list using a category in the address itself, such as ZIP code or city name.

You can also manage other kinds of lists, such as record collection catalogs or simple inventories. Use the DOS SORT filter to keep your list in order and the FIND filter to get a quick look at, say, the number of items you have left in stock or which of your records includes a certain song. To add new data or make changes, run your text editor and let its search function take you to the right place.

This system won't threaten dBASE II's market share, nor is it likely to take business away from popular file management programs. It won't prompt you for data or do any preliminary checking. Yet it can be very versatile, and—good news for students and researchers on low budgets, before the grants are awarded—it doesn't cost a penny extra. ■

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BIBLIOGRAPHY
EFFECTIVENESS
PERCUTANEOUS
ABSORPTION
PHARMACOLOGY
TOXICITY IN TOPICAL THERAPY
    TOXICITY:SYSTEMIC
    TOXICITY:GI
    TOXICITY:SKIN
TOXICITY IN SYSTEMIC THERAPY
```

Figure 1: Index for an index-card-style database.

```
BIBLIOGRAPHY
1) Tsuji T., Sugai T., 1972. "Topically Administered Fluorouracil in
Psoriasis." Arch Dec. 105:208-212.
EFFECTIVENESS
13 patients treated with 5 percent ointment under saran wrap
occlusion 24 hours/day for 7 days had complete clearing lasting
6-12 months. (1)
```

Figure 2: Part of the data section in Dale's database on the use of 5-Fluorouracil for the treatment of psoriasis.



Coming Up



C and BASIC Debuggers

Do you groan at the thought of debugging your BASIC or C programs? *PC* reviews two debuggers that make this time-consuming task a relative breeze.

Voice Recognition and Speech Synthesis

With new software and boards, PCs can hear and speak. Some software packages and hardware enable PCs to recognize speech, store it in digital form, and display it on a screen as words. Other software and hardware combinations synthesize speech, converting digitally stored sound into wavelengths and then using a speaker to reproduce them. Some packages perform both functions. This technology offers new prospects for telephone message systems and voice mail, which store messages on disk instead of using real people for these monotonous tasks.

PC reviews some of the newest of these speech synthesis and voice recognition packages. In addition, we explore how they're being used to help everyone from businesspeople to the handicapped. And Winn Rosch explains how he built a voice synthesizer from a kit.

Sales Tracking

Entrepreneur Randy Winters has designed a sales-tracking program called *EasySales Pro* to help salespeople determine how much time and effort they should spend on a particular prospect, and how close they are to meeting their quota. Heidi Waldrop describes how Winters uses his program as a tool in selling artist Gahan Wilson's work.

Two Databases

Despite *PC*'s extensive coverage of DBMS packages in Project: Database, new DBMS packages continue to flood onto the market, and we're committed to continue covering the latest ones. We test both the *Kaleidoscope* database and *GOLDATABase* and provide charts describing their good and bad points. John Phillips discusses whether *Kaleidoscope* is as good as its packaging looks, and Russell Lipton finds *GOLDATABase* a good product for computer novices and experts but wonders whether its design takes into account the needs of the vast middle ground of intermediate nonprogramming users.

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